

HIGHLIGHTS OF A GEOMORPHIC AND MUSSEL HABITAT ASSESSMENT, MIDDLE APALACHICOLA RIVER



**University of Florida & Apalachicola Riverkeeper
January 2017**

UF TEAM

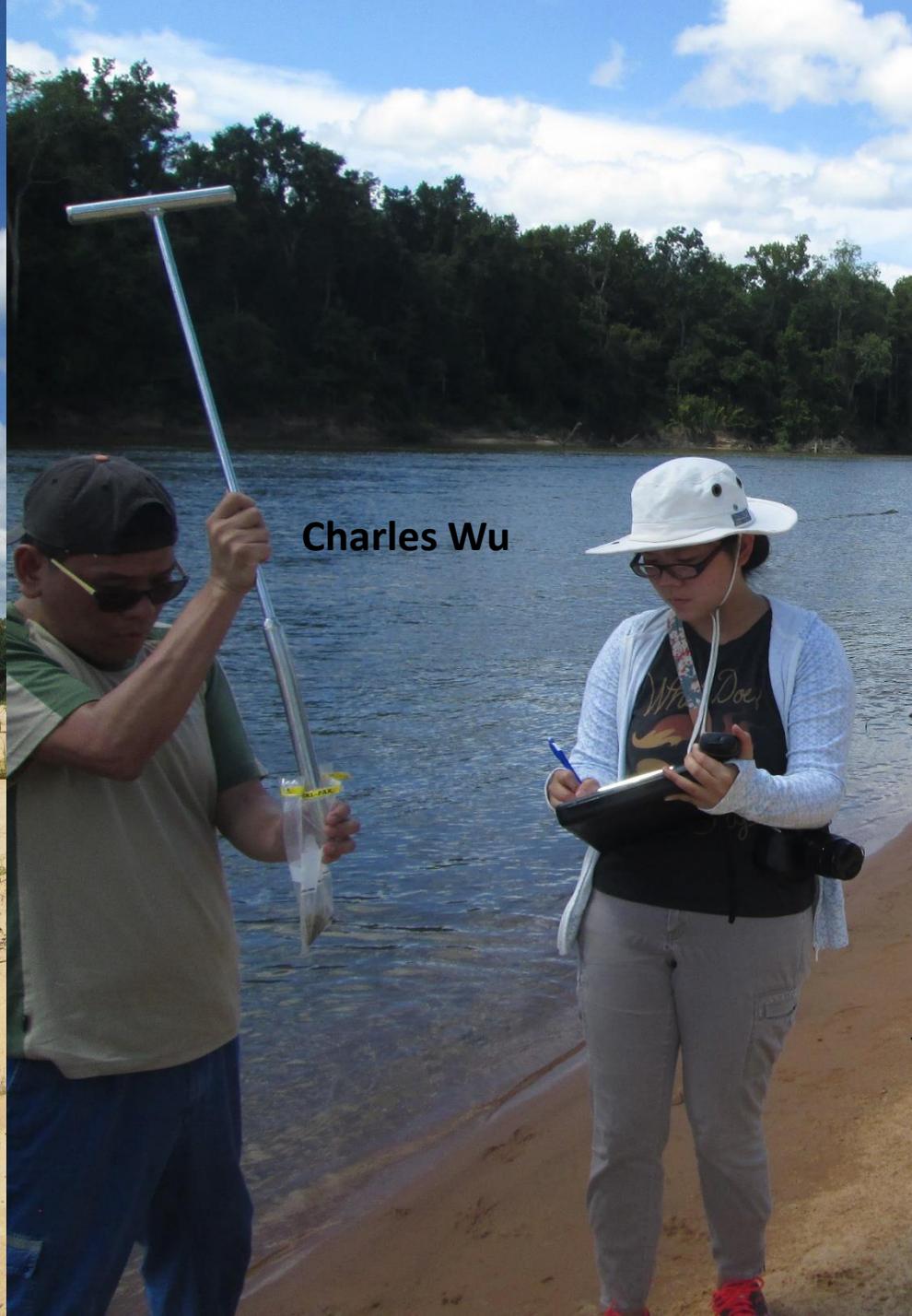


- Joann Mossa
- Yin-Hsuen Chen
- Matt Dietch
- Charles Wu





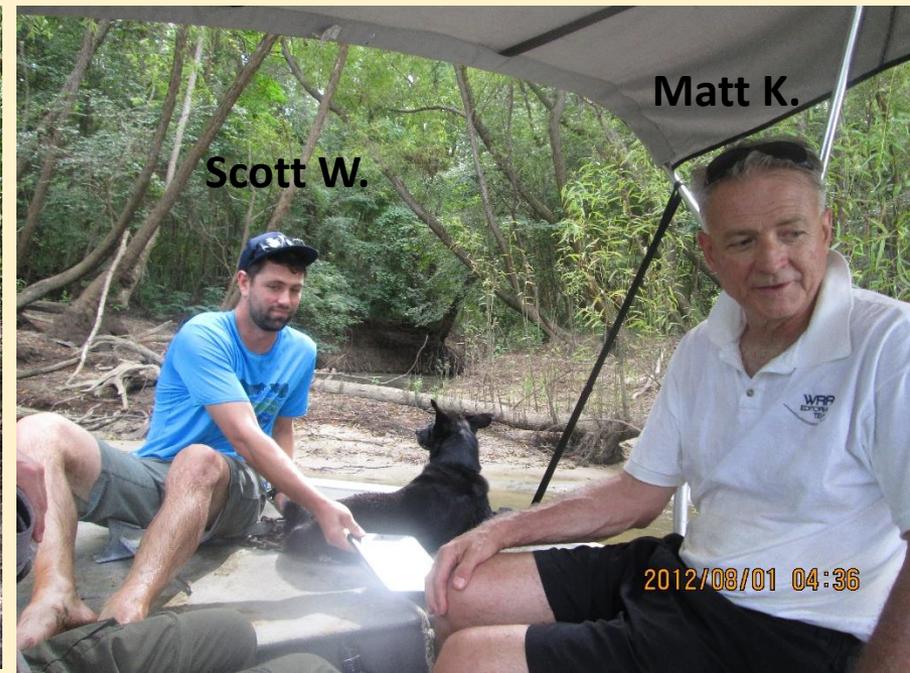
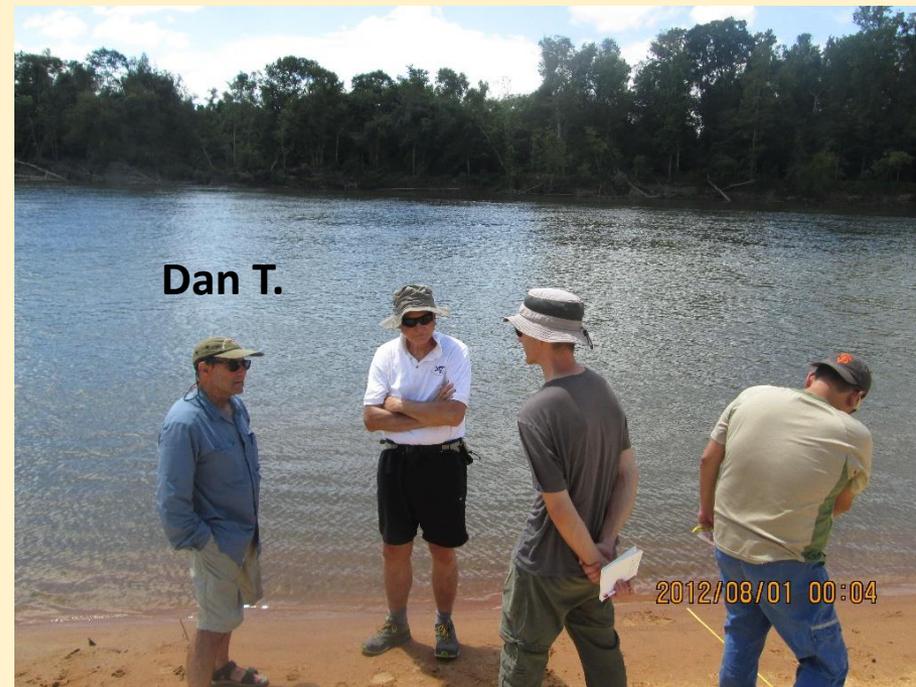
Matt D.



Charles Wu

RIVERKEEPER CREW

- Dan Tonsmeire, Apalachicola R.
- Matt Kondolf, Univ. California-Berkeley
- Mike Gangloff, Appalachian State Univ. (+Dave and Worth)
- Scott Walls, Walls Land & Water





- Mike Gangloff (and friends Worth and Dave)
- Scott Walls



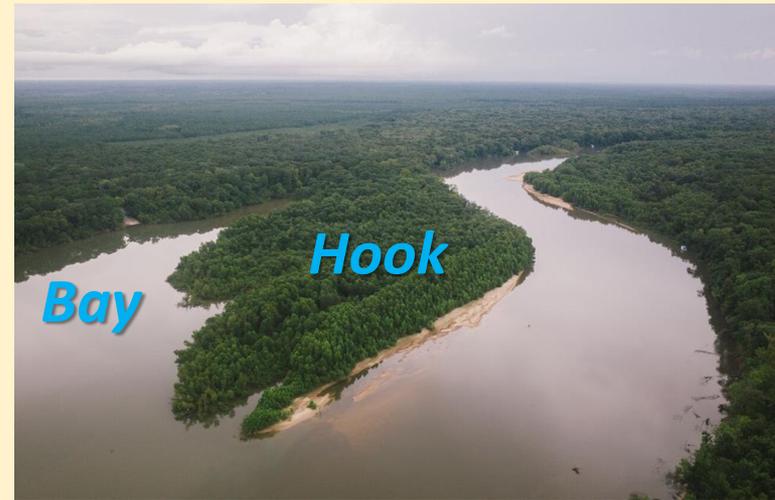
THANKS

- Sponsor: Florida Fish and Wildlife Commission, AHRES (Aquatic Habitat Restoration Enhancement Subsection)
- Investigating RM 40-65
- Geomorphology and Mussels habitat components
- Geomorphologists conducted two site visits at low water
 - 7500 cfs, August 2015
 - 6000 cfs, August 2016
- One site visit at high water
 - ~35000 cfs March 2016

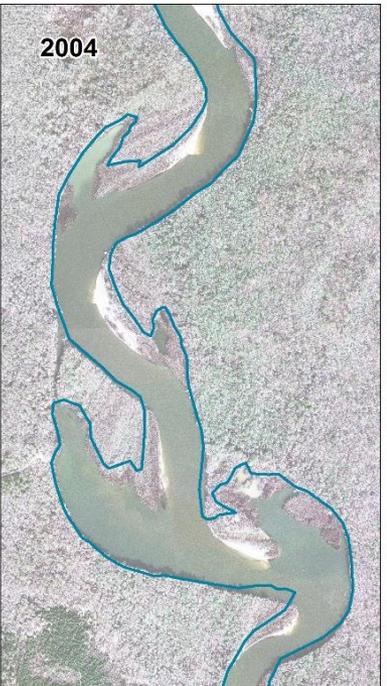
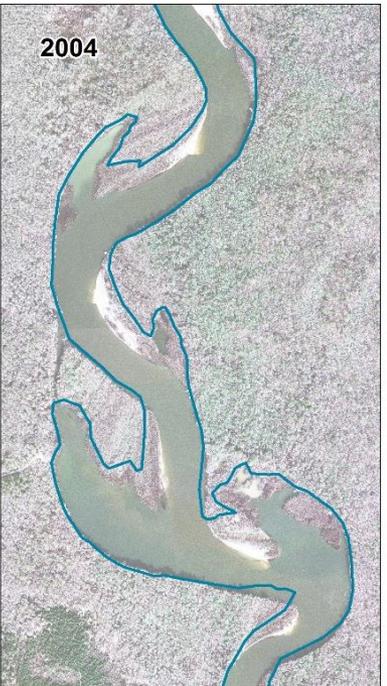
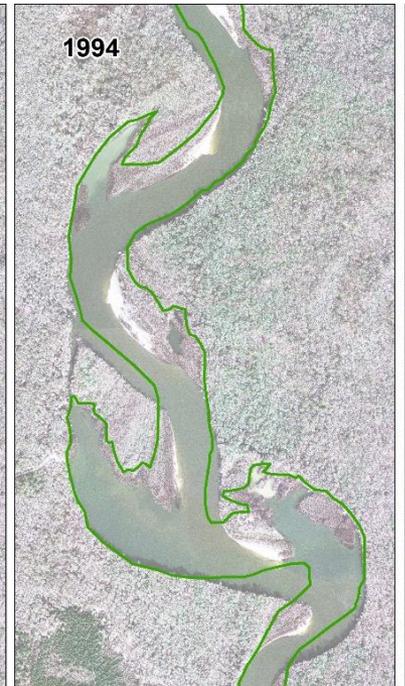
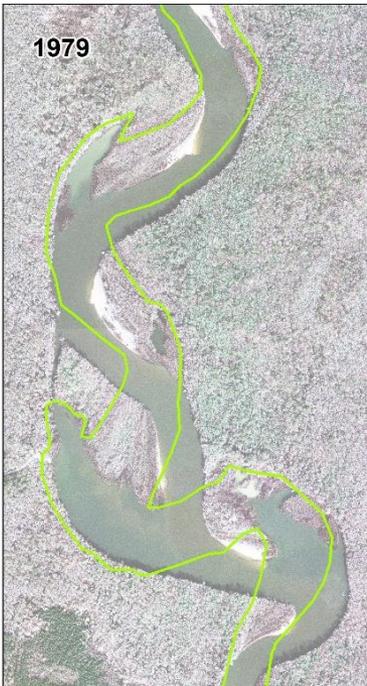
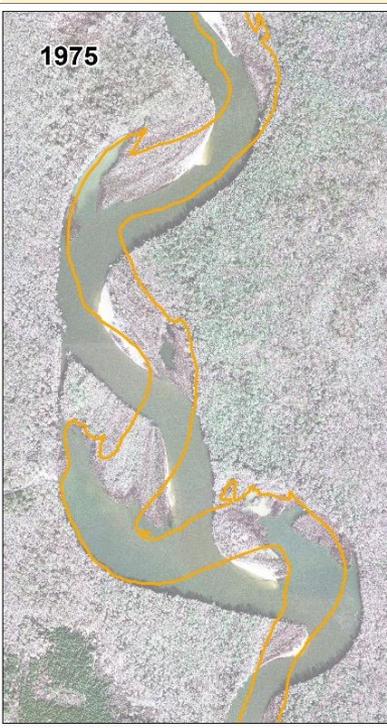
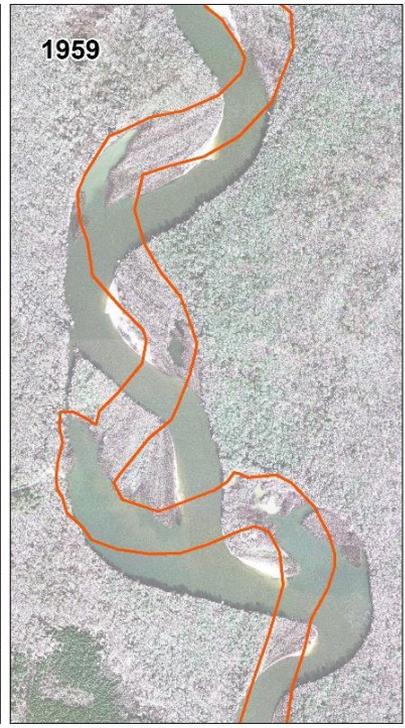
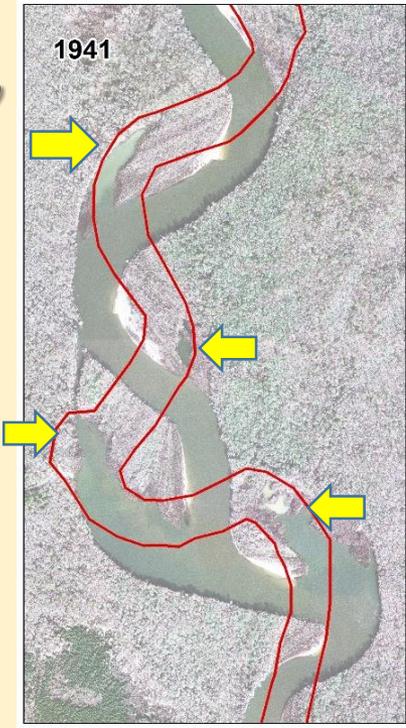
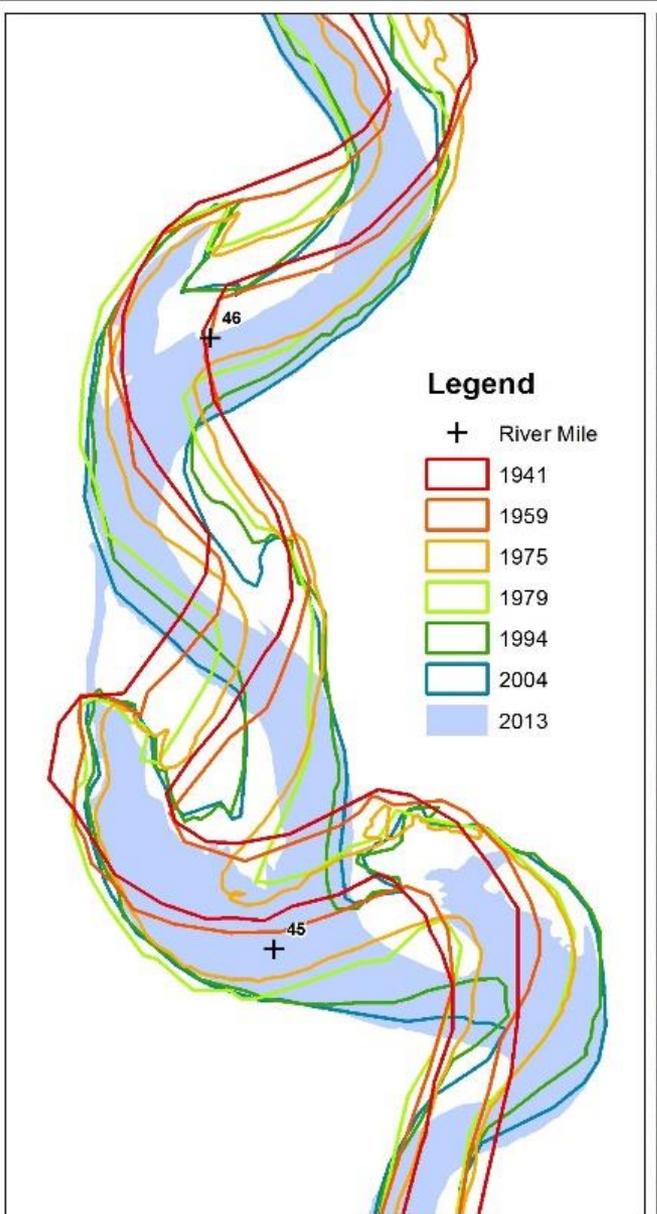


SELECTED HIGHLIGHTS

- Examining channel change, including hooks and bays
- Tying channel profile to historic dredging, hydrologic change and geologic factors
- Measuring anthropogenic landform volumes and changes
- Examining sediments on point bars related to historic disposal and potential vegetative restoration. Some sampling of dredge mounds and flood deposits.
- Background/baseline work on slough morphology and water quality for understanding system & possible restoration
- Mussels quantities and habitat

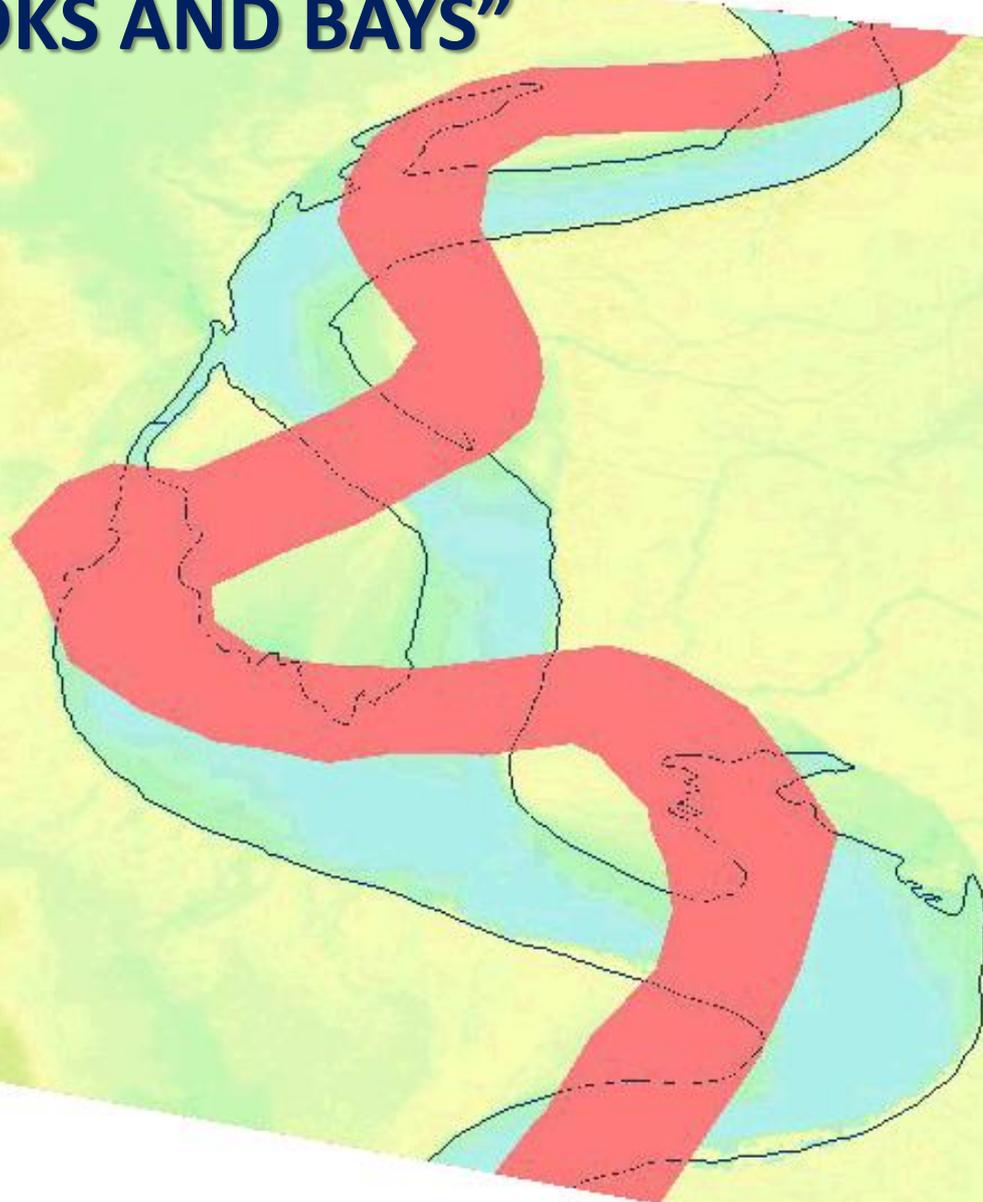


“HOOKS AND BAYS”

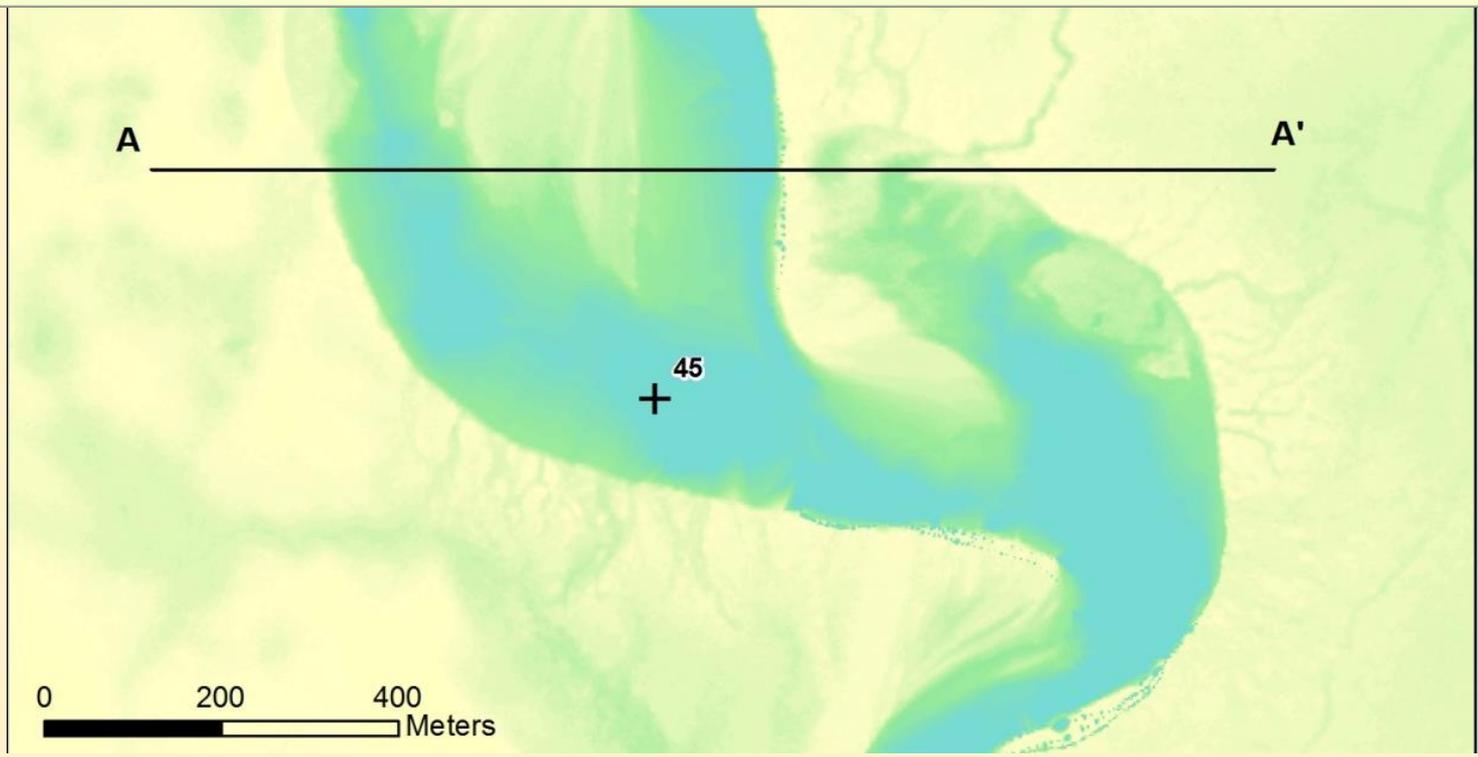
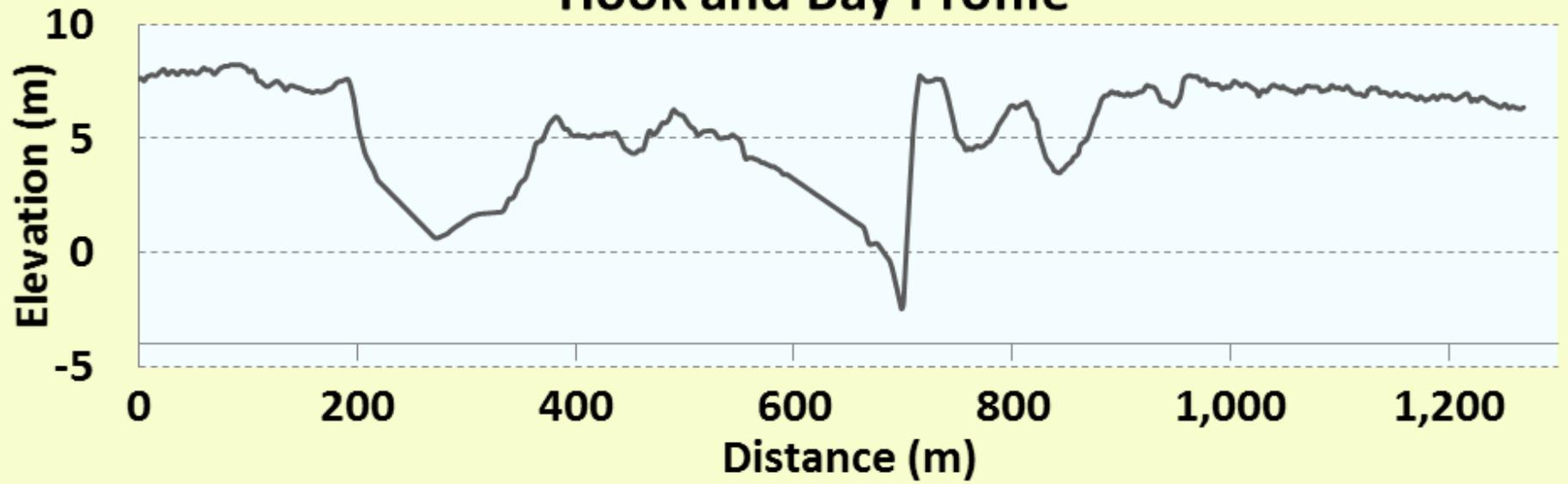


“HOOKS AND BAYS”

1941

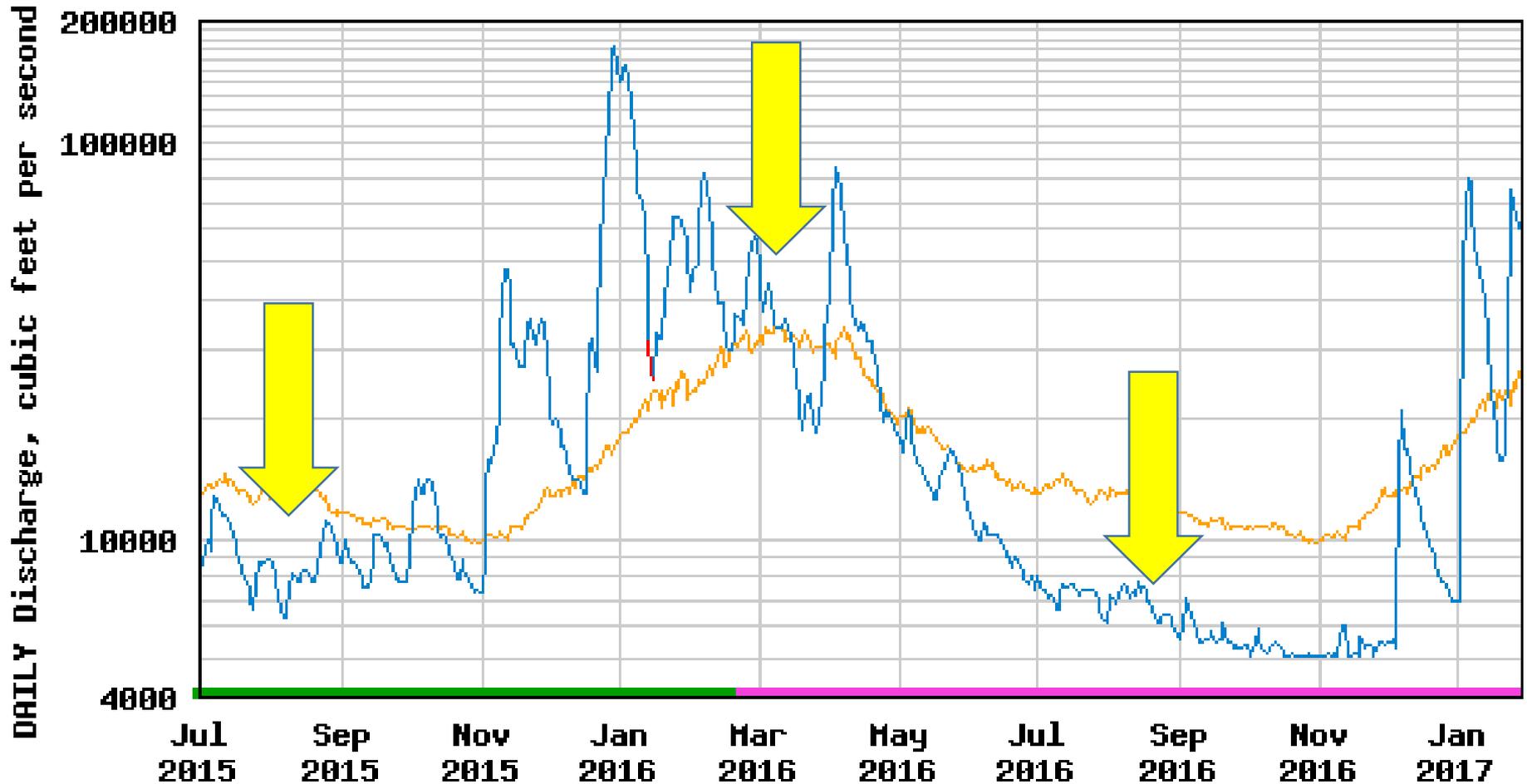


Hook and Bay Profile



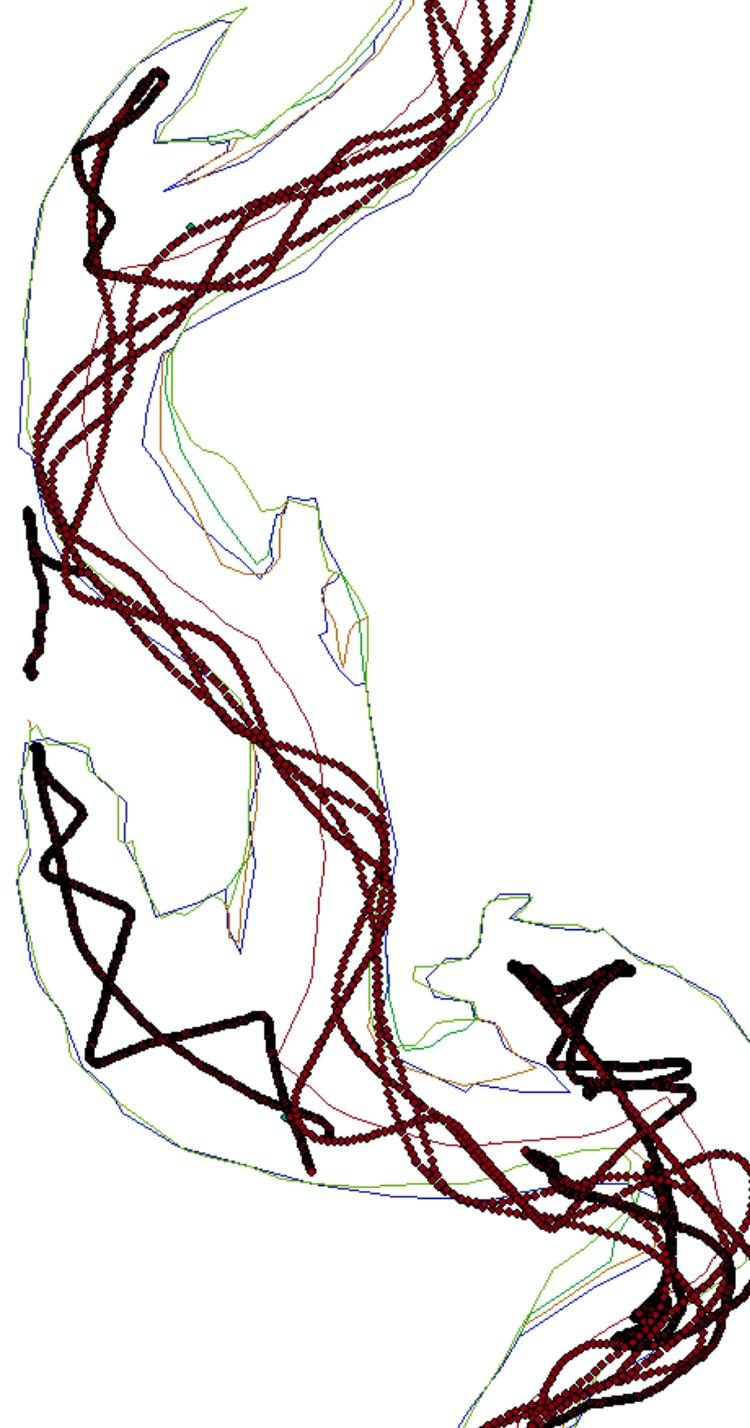
FIELD EXCURSIONS

USGS 02358000 APALACHICOLA RIVER AT CHATTAHOOCHEE FLA

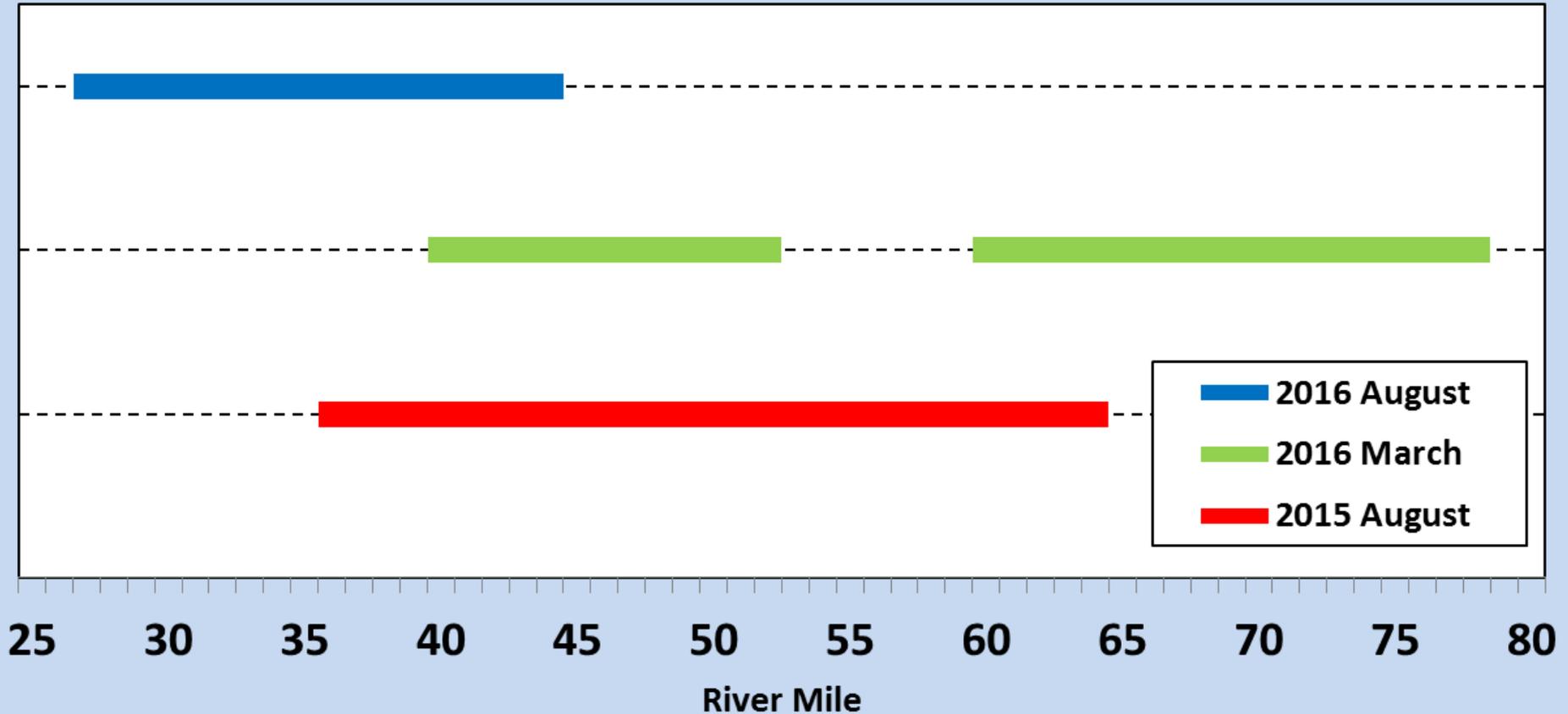


- Median daily statistic (87 years)
- Daily mean discharge
- Estimated daily mean discharge
- Period of approved data
- Period of provisional data

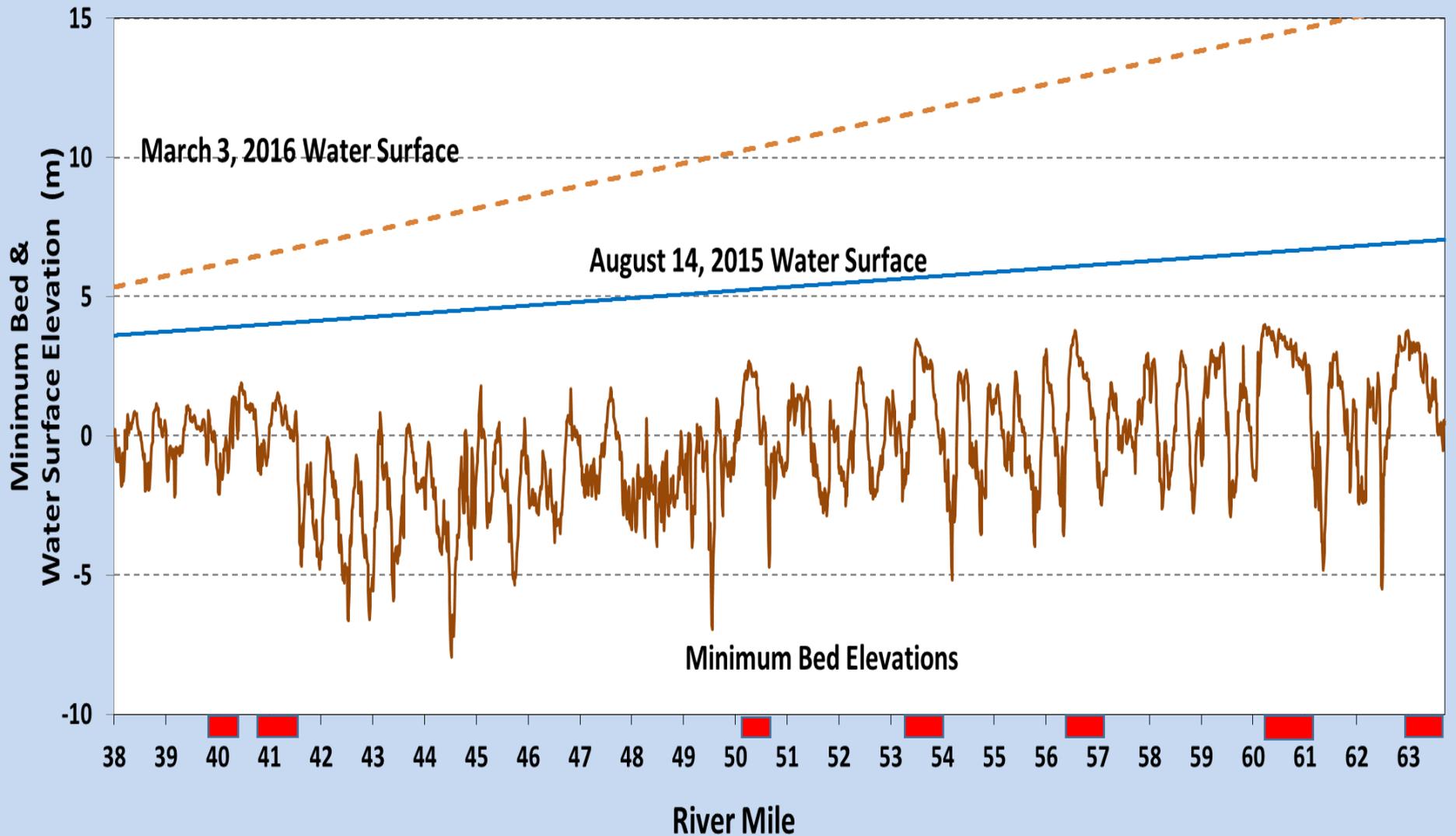
“SPAGHETTI” TRAILS WITH SONAR



SONAR DATA ON FIELD EXCURSIONS USED TO BUILD A LONGITUDINAL PROFILE

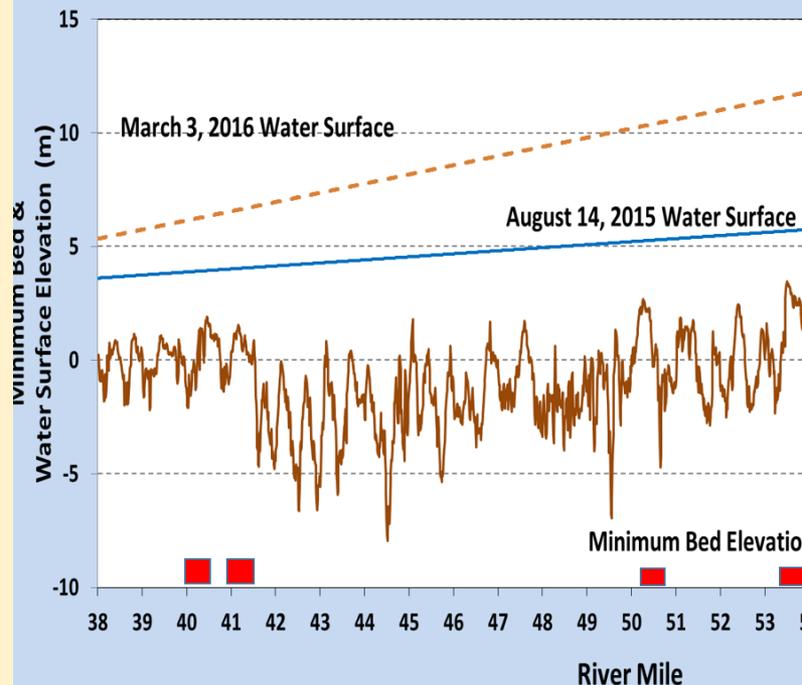
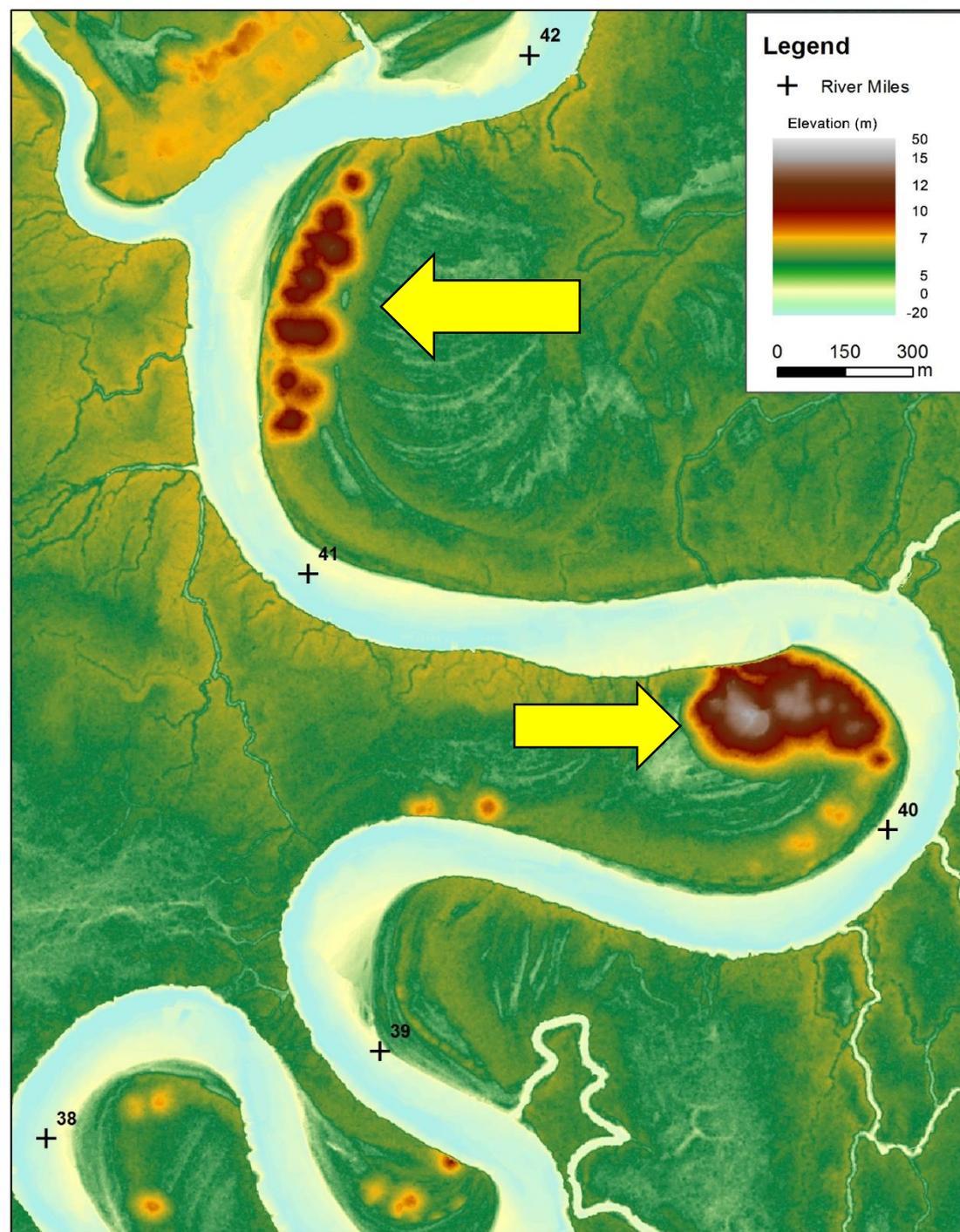


LONGITUDINAL PROFILE AND WATER LEVELS AUGUST 2015 VS. MARCH 2016

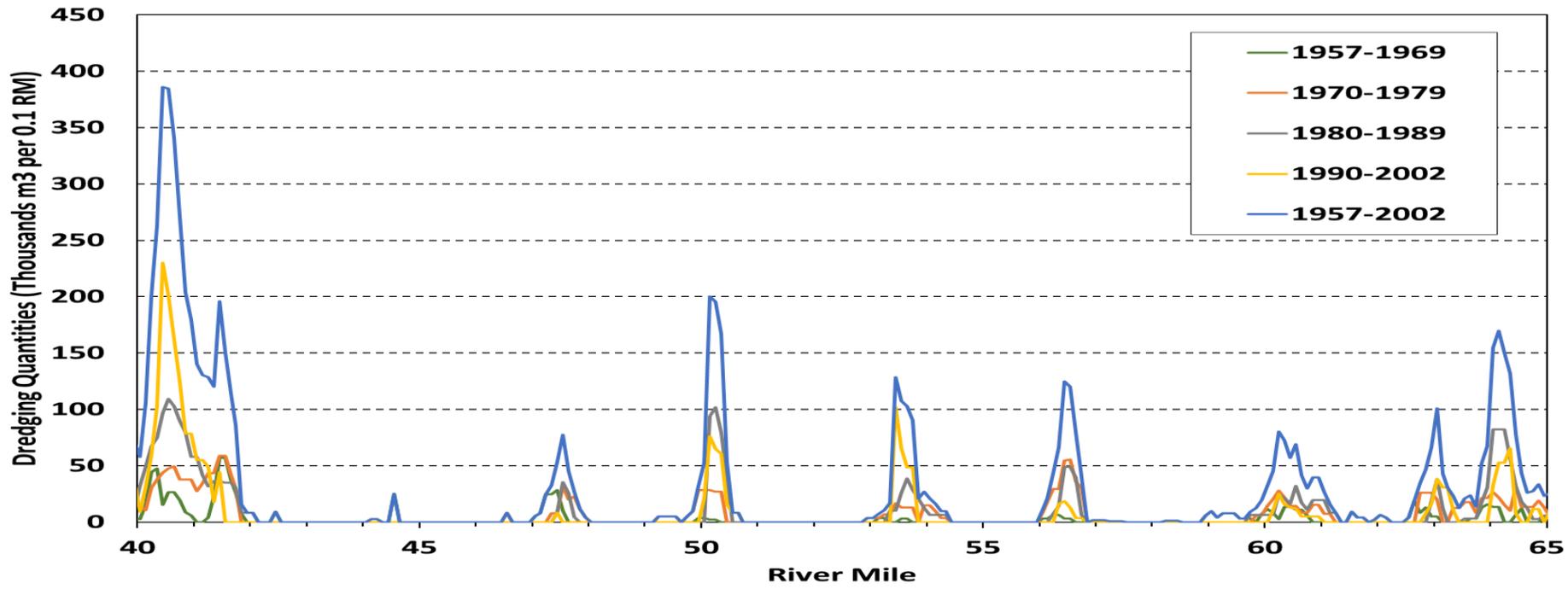
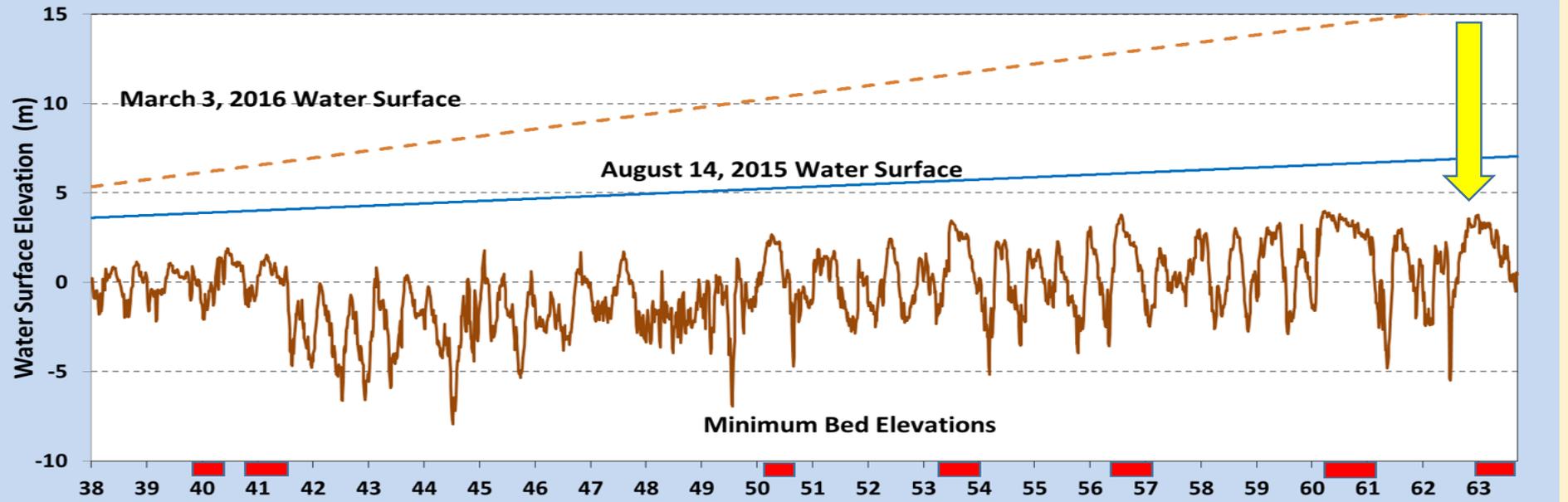


DREDGE MOUND COMPLEXES NEAR CHIPOLA CUTOFF AND SWIFT SLOUGH

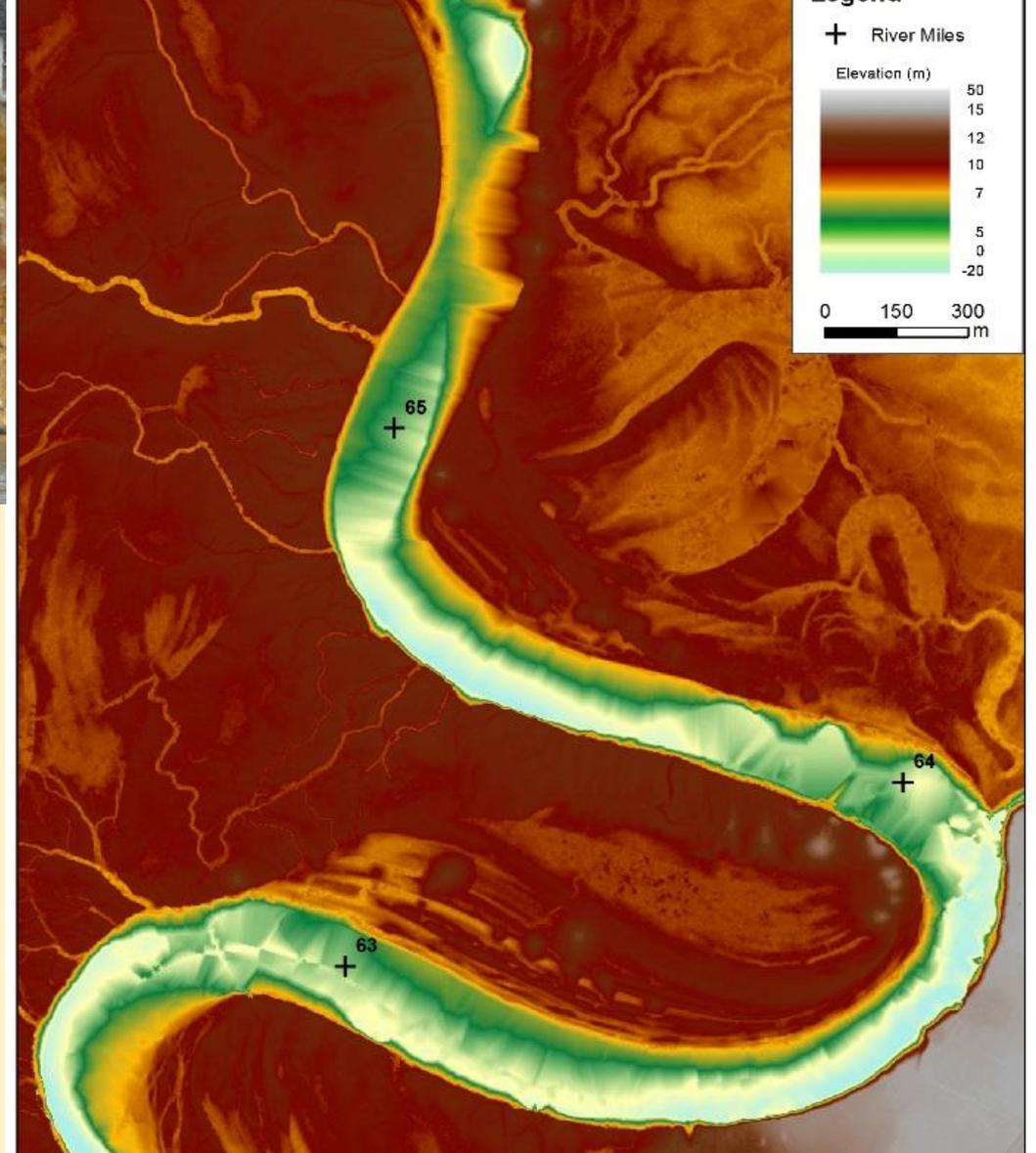
- Flow diversion
- Hard point



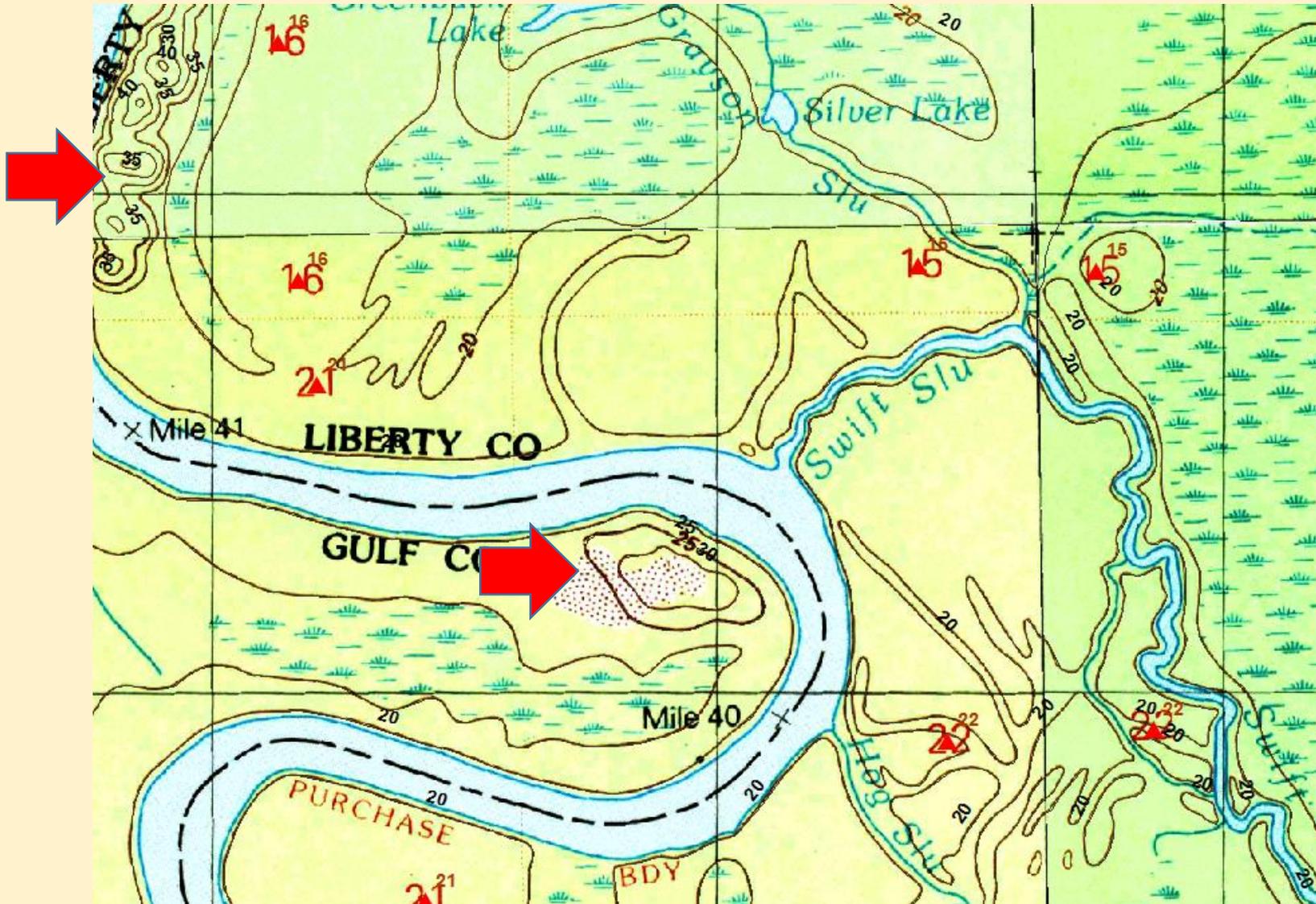
PROFILE VS. DREDGING DURING NAVIGATION PLAN



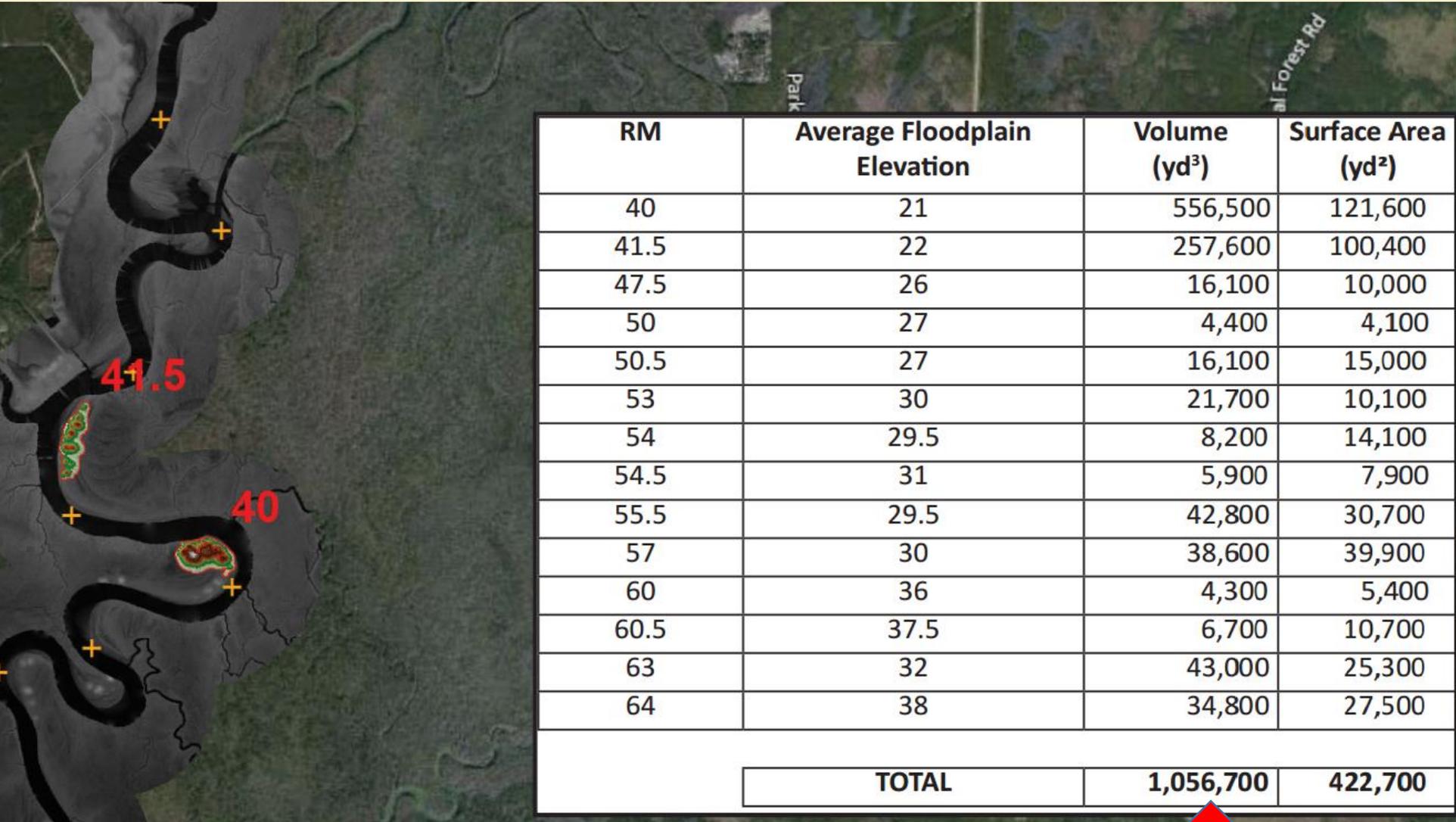
ESTIFFANUGULA



FLOODPLAIN DREDGE SPOIL MOUND COMPLEX VOLUME AND CHANGE ANALYSIS



MOUND COMPLEX VOLUMES (FROM 2007 LiDAR)



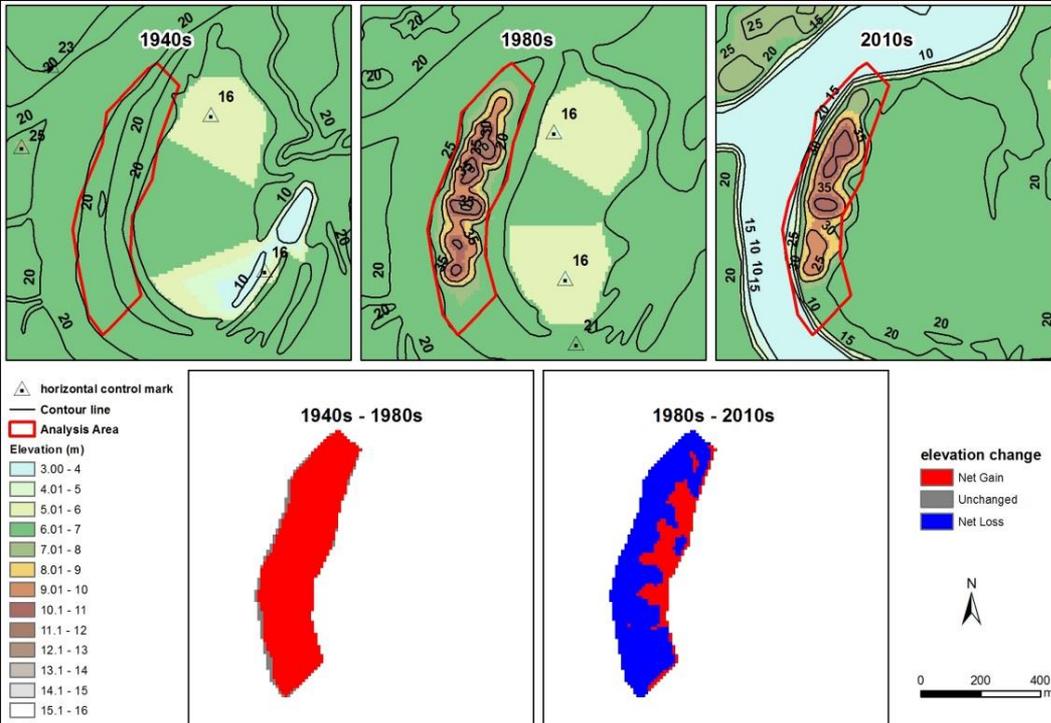
- >1,000,000 yd³ spoil volume on floodplain



CHANGE ANALYSIS FROM DIGITIZED QUADS

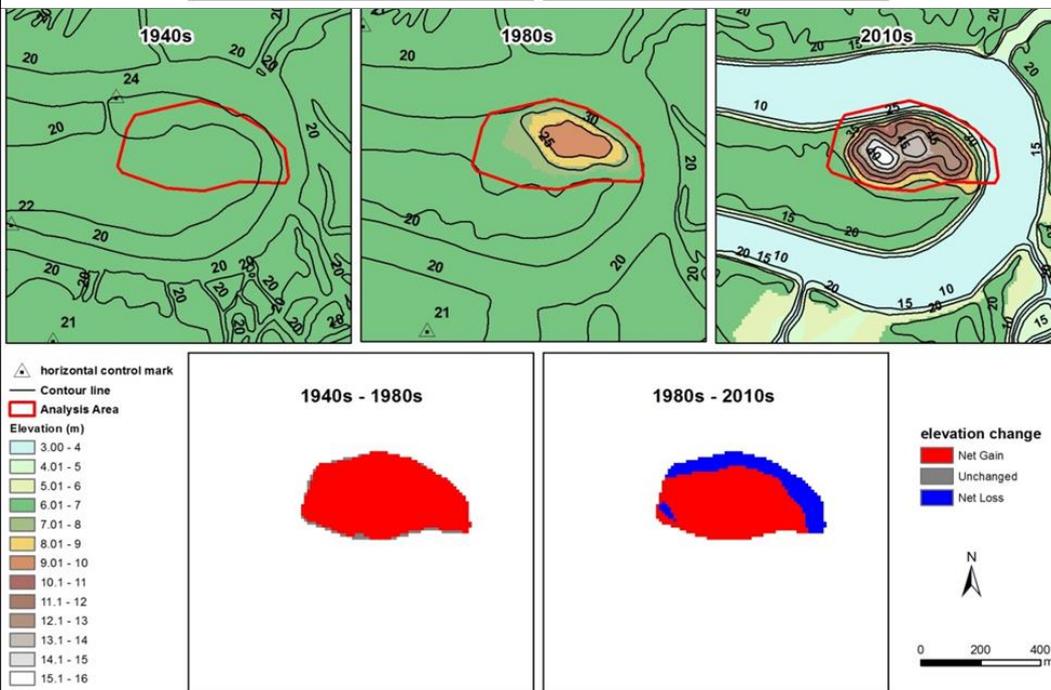
Mound complex RM 41.5 L

- Volumes increased 306,359 m³ between 1940s & 1980s
- From the 1980s to 2010s includes 21,810 m³ of gain and 141,437 m³ of loss (42% of total)

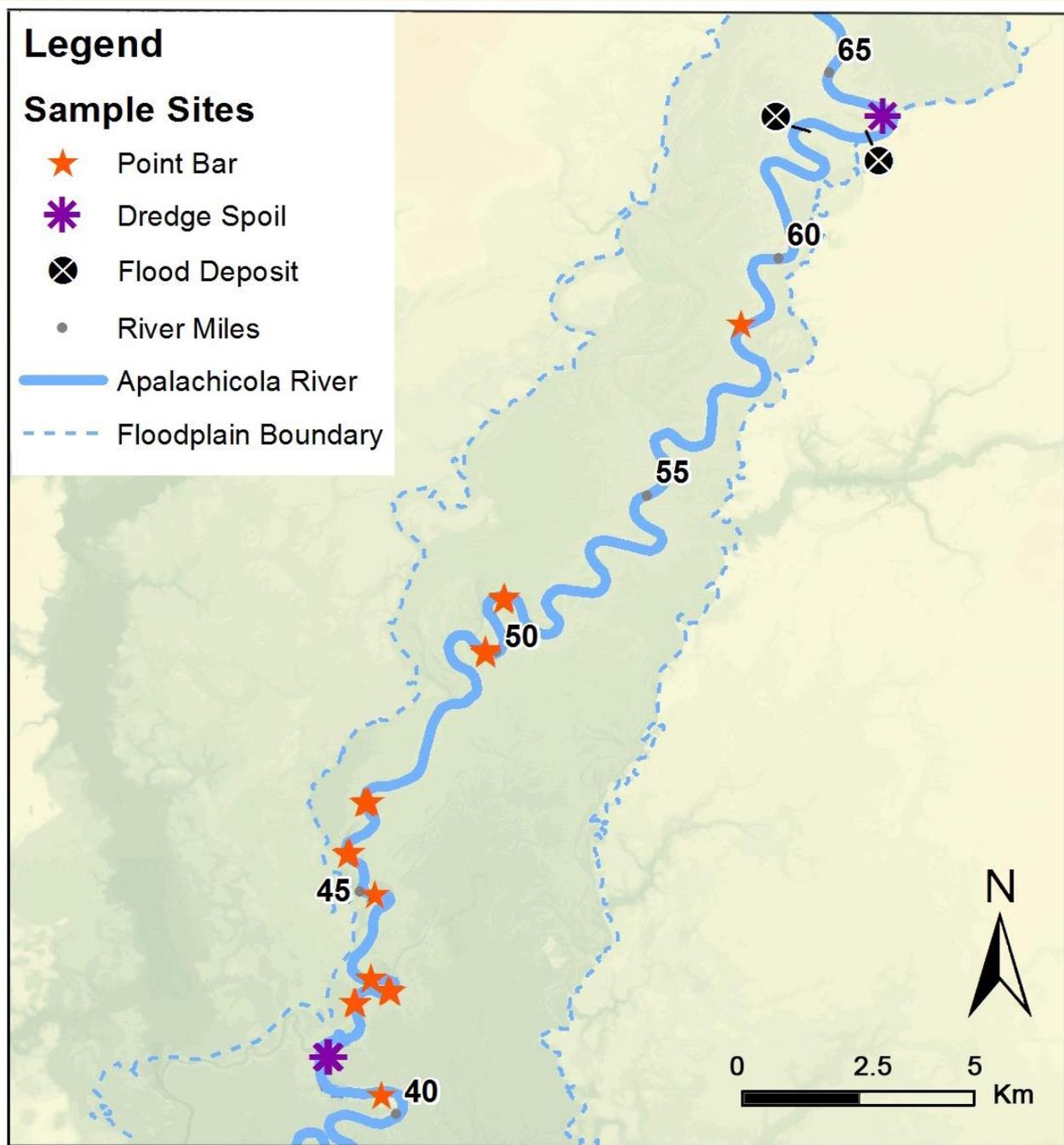


Mound complex RM 40.3 R

- Gain of 174,180 m³ between the 1940s & 1980s
- Between 1980s & 2010s gains of 299,256 m³ and losses of 73,147 m³ due to river erosion (15% of total)



SEDIMENT STUDIES AND SAMPLING

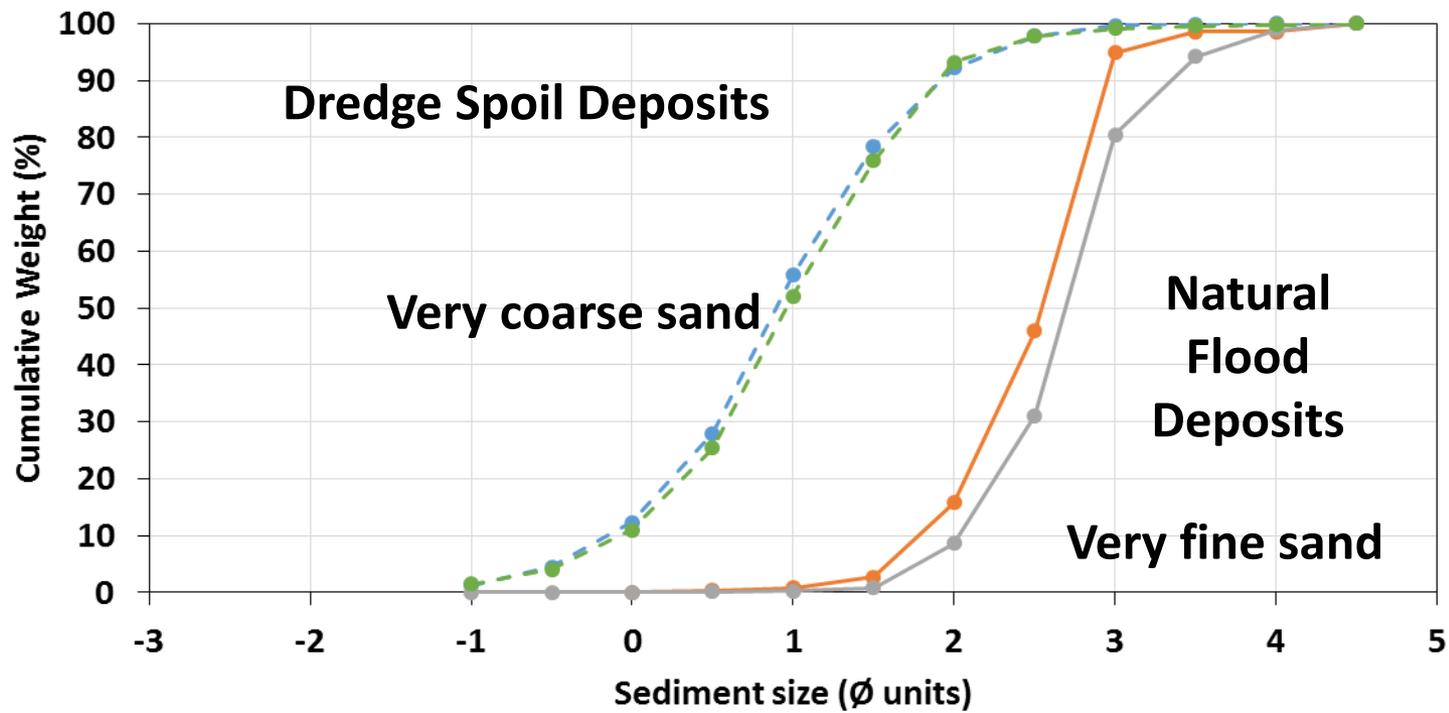


FLOODPLAIN DREDGE SPOIL AREAS

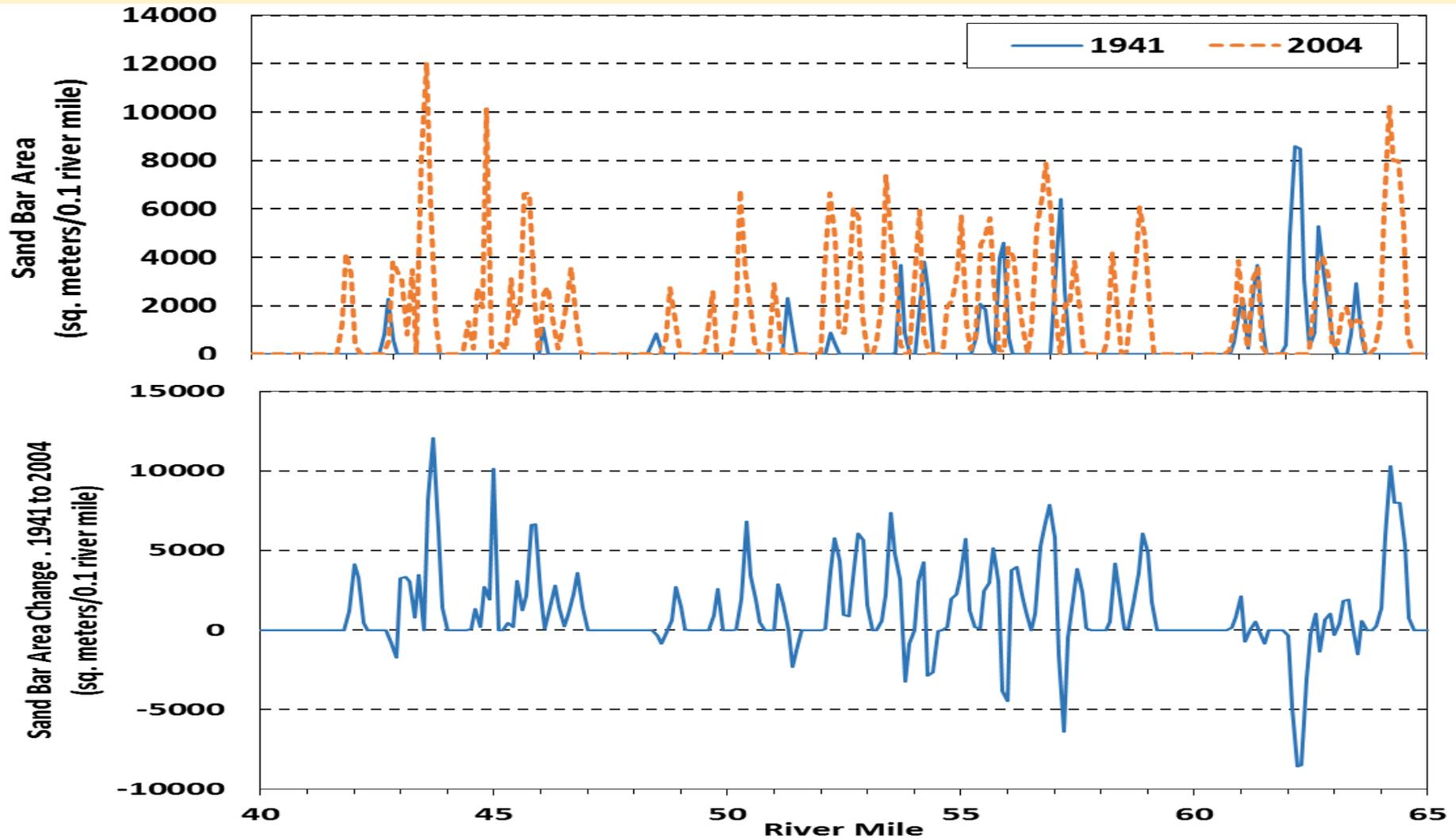


- Across from Estiffanula and Chipola Cutoff

DREDGE DEPOSITS VS. FLOOD DEPOSITS

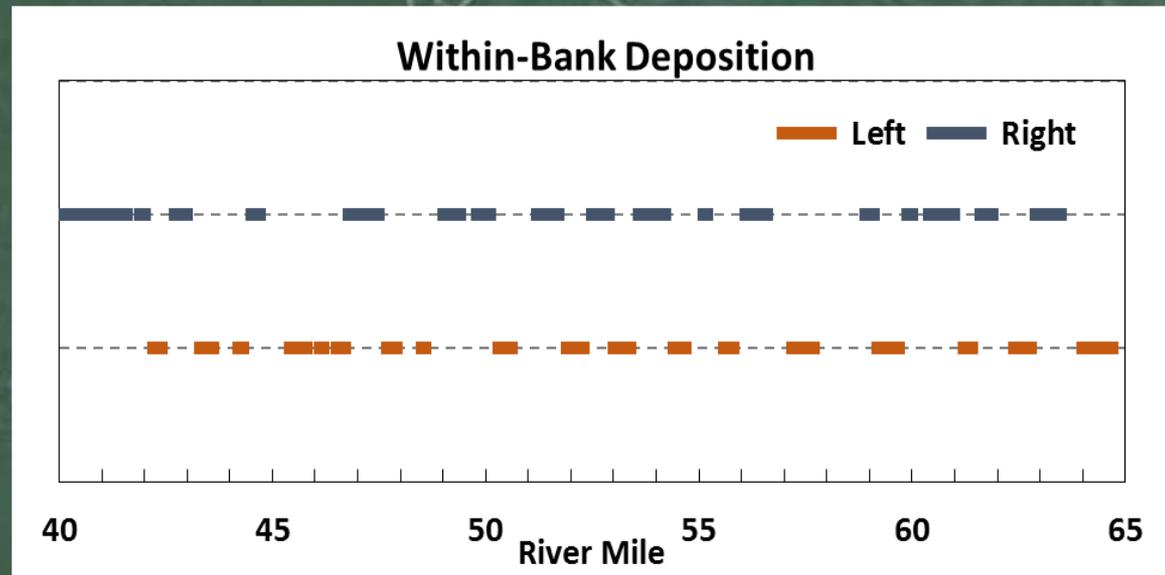


GROWTH OF SAND BARS: Q NEARLY IDENTICAL



- From 104,800 m² in 1941 to 380,500 m² in 2004
- 263% increase in sand bar area
- In part, related to within-bank deposition of dredge material

WITHIN-BANK DEPOSITION ENLARGED SAND BARS

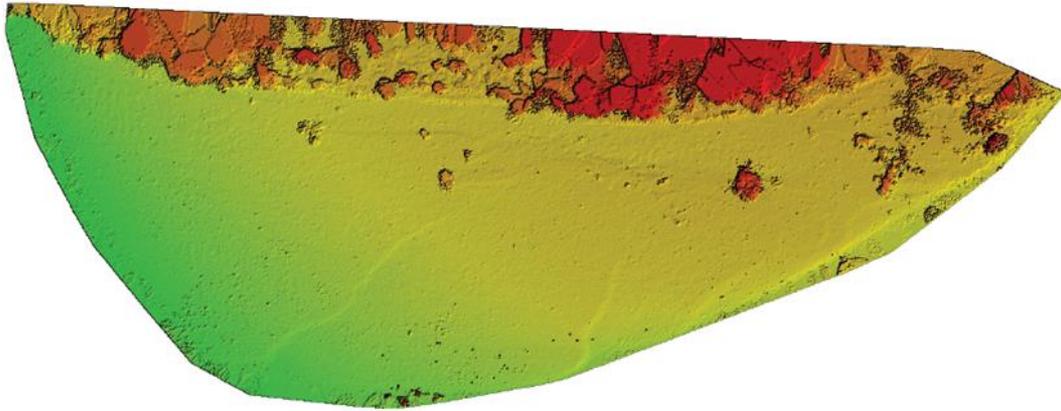


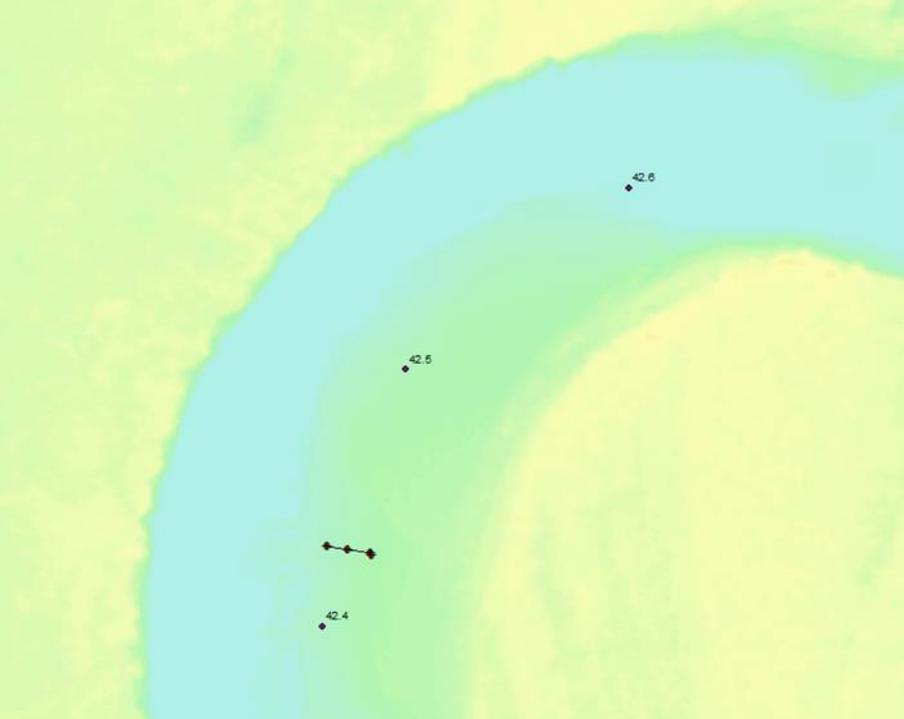
POINT BARS: SEDIMENTS AND VEGETATION

- Point bars are much larger
- In future work, we would like to know much are they revegetating, and see if plantings would help.

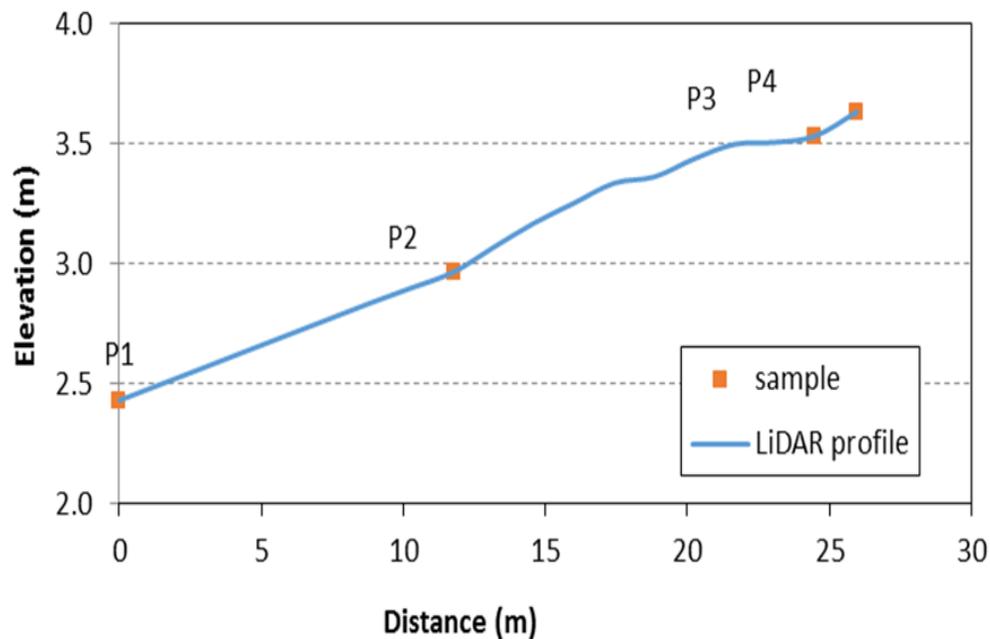


SEDIMENTS

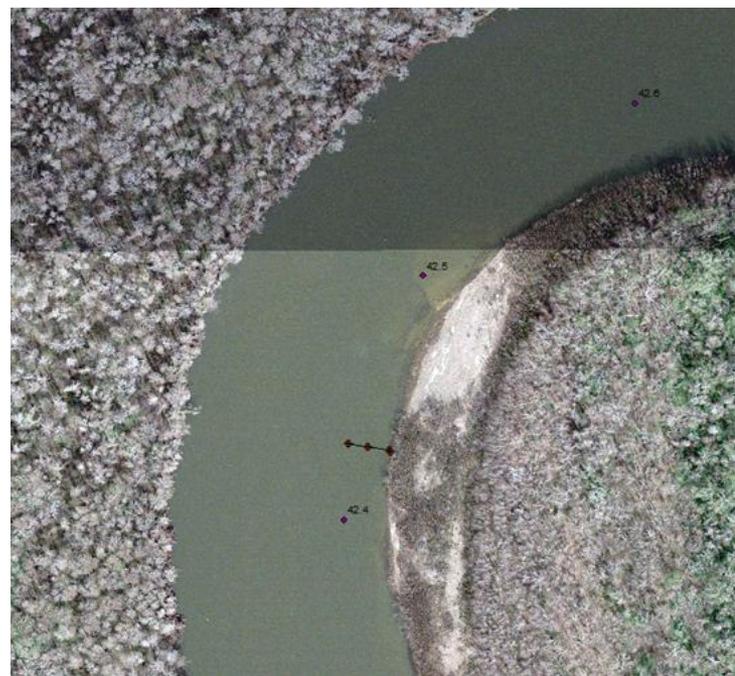
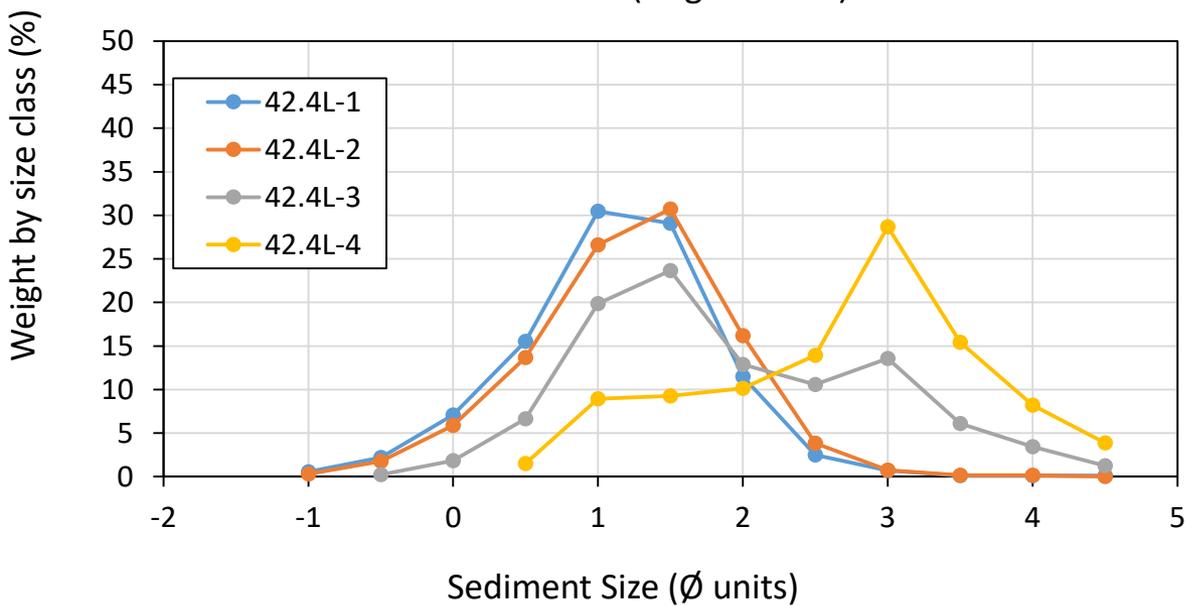




SB 42.4 L (LiDAR elevation)



Sand Bar RM 42.4L (August 2016)

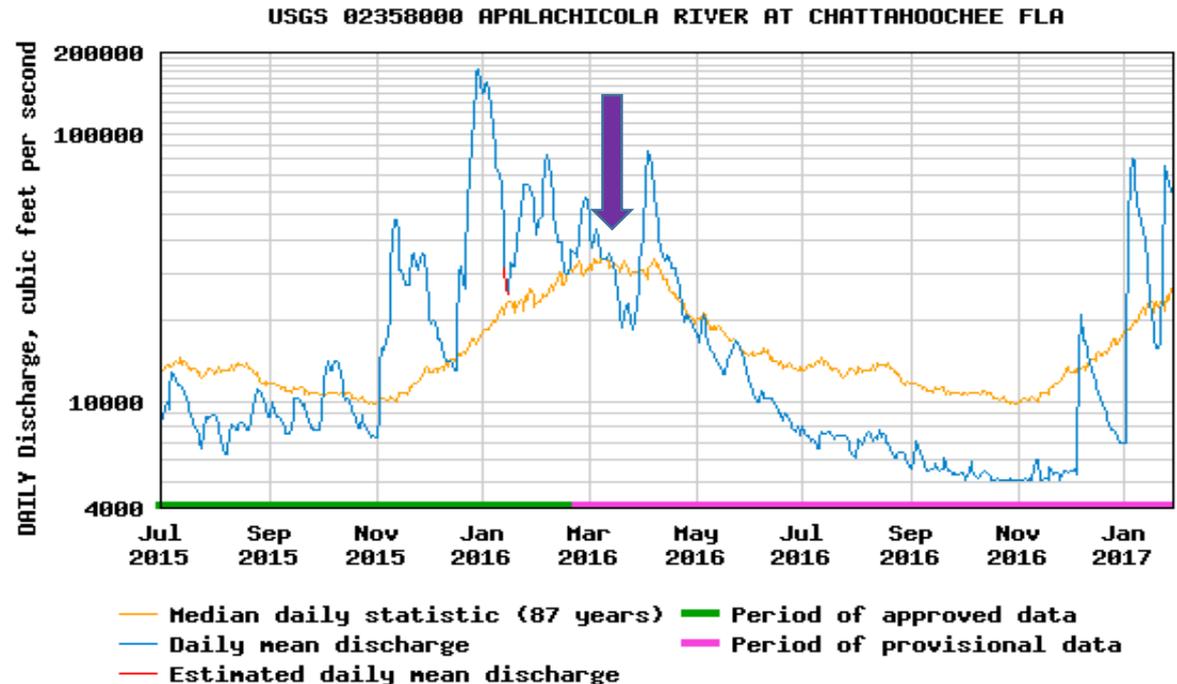
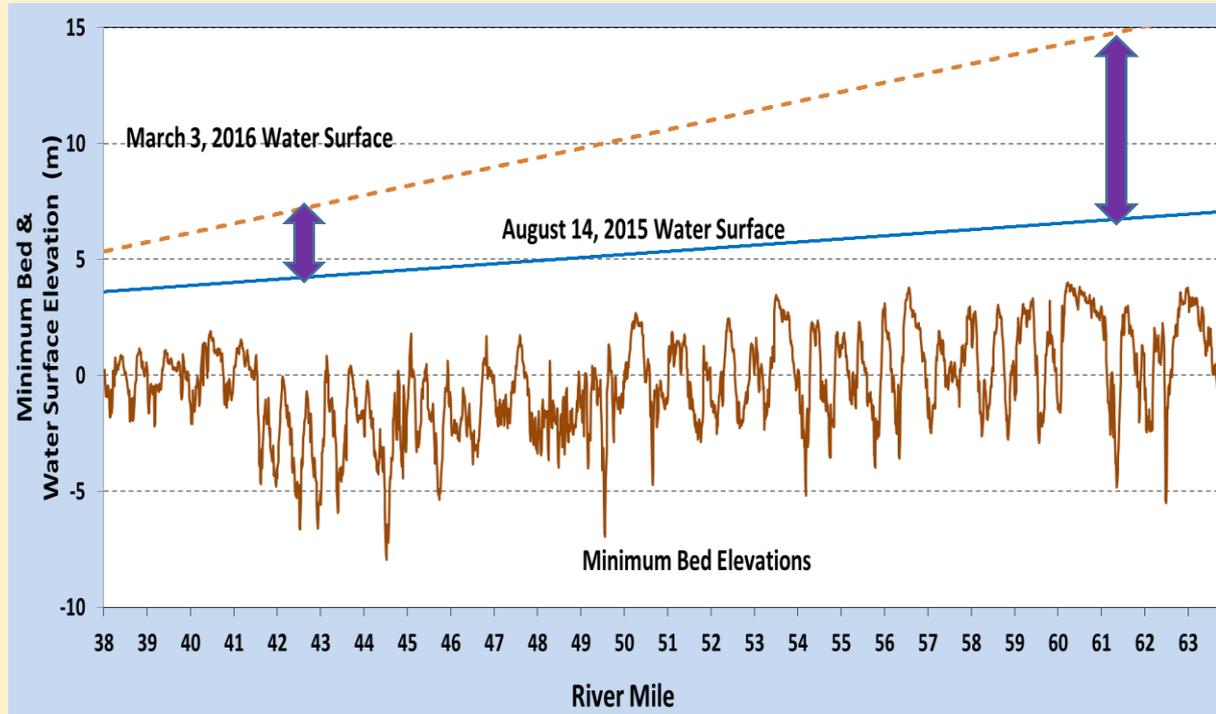




- **Willows add roughness, promote deposition, adds elevation**
- **Even grasses and weeds encourage organic deposition**
- **Plantings could decrease the bar area and channel width, would stabilize sand and improve mussel habitat**

**SLOUGH STUDIES:
WHEN WATER
LEVELS ARE
HIGHER, CAN GET
BACK INTO
FLOODPLAIN WITH
BOAT.**

**AT LOW WATER,
CAN WALK THEM.**



SLOUGH RESTORATION AND BOTTOM MAPPING DURING FLOODS



- **With sonar, mapped depths and converted to bed elevations by subtracting the water surface (assumed from RM on MC)**
- **Maps show bed elevations in the 95th percentile (sills)**

BEE TREE SLOUGH

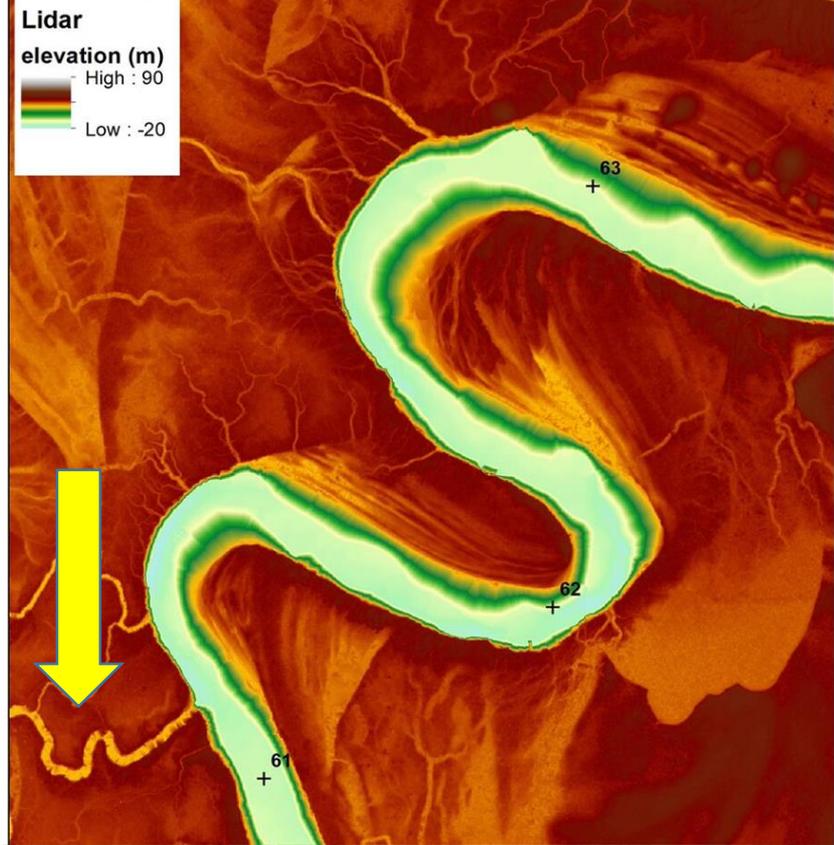
70
+
Dead River

Bee Tree Slough

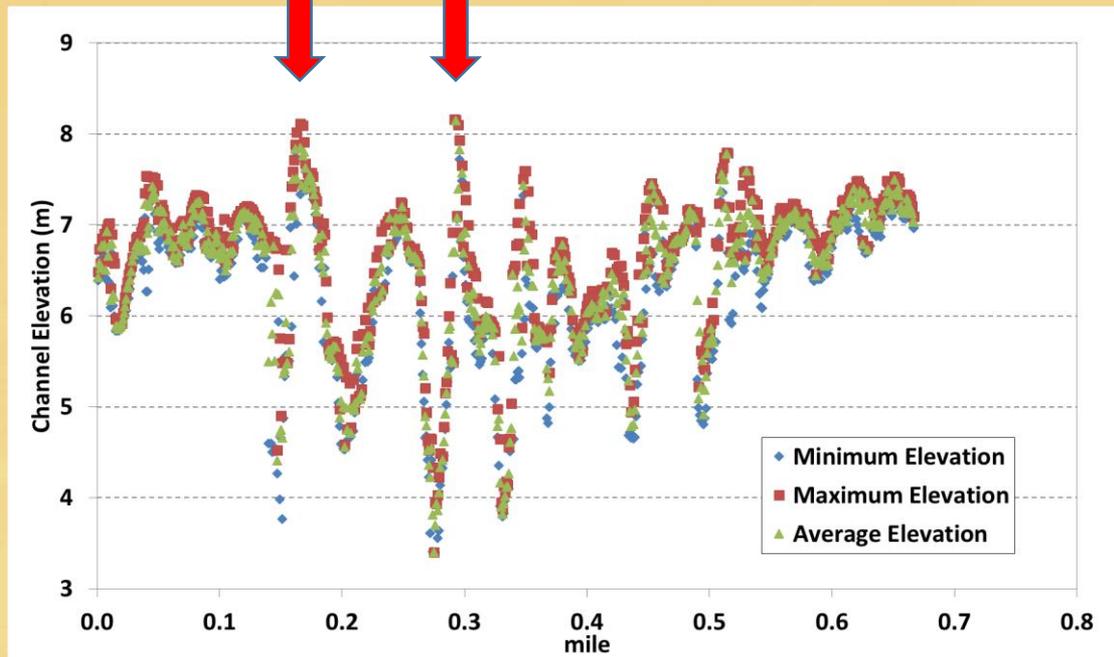
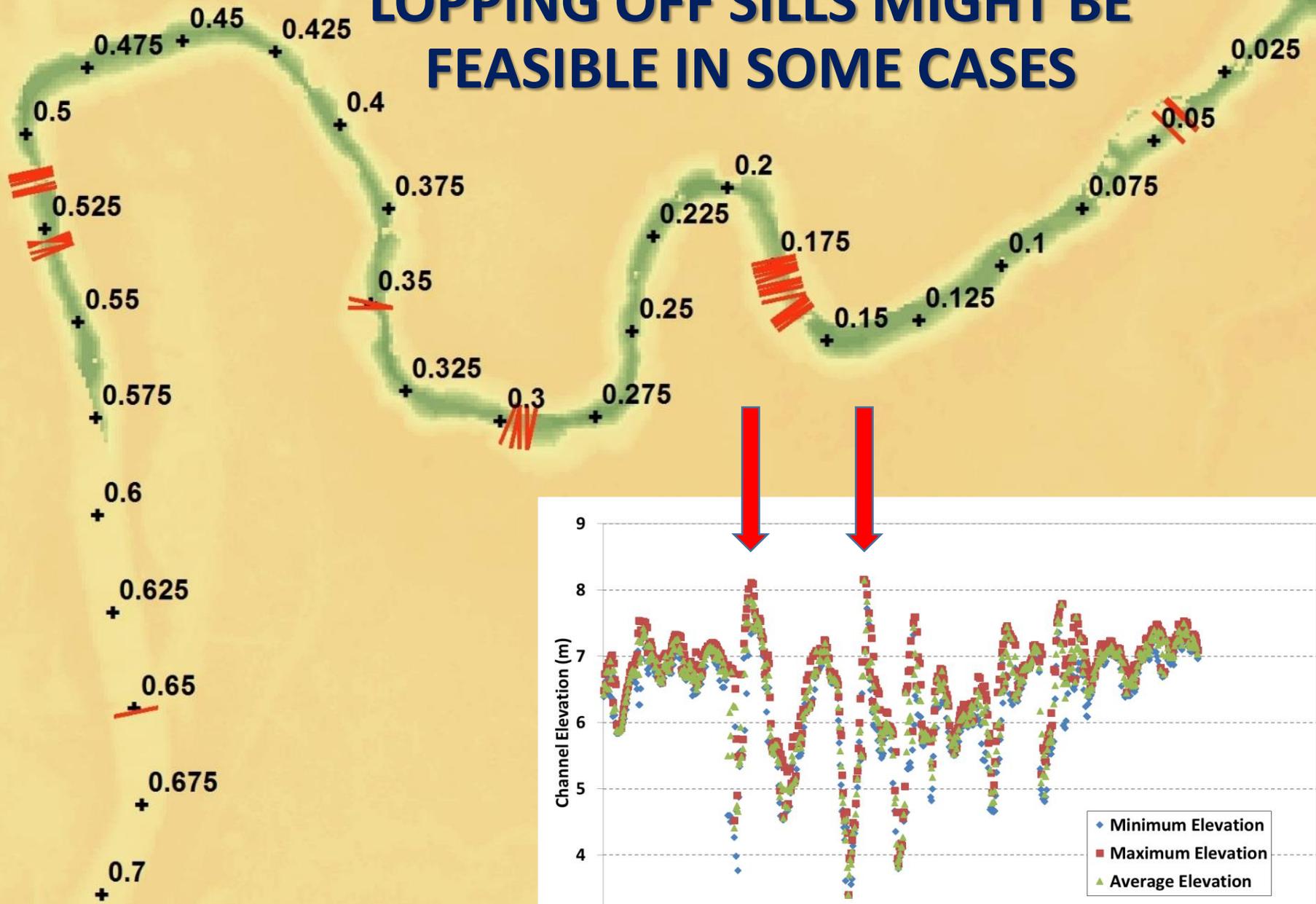
65
+

60
+

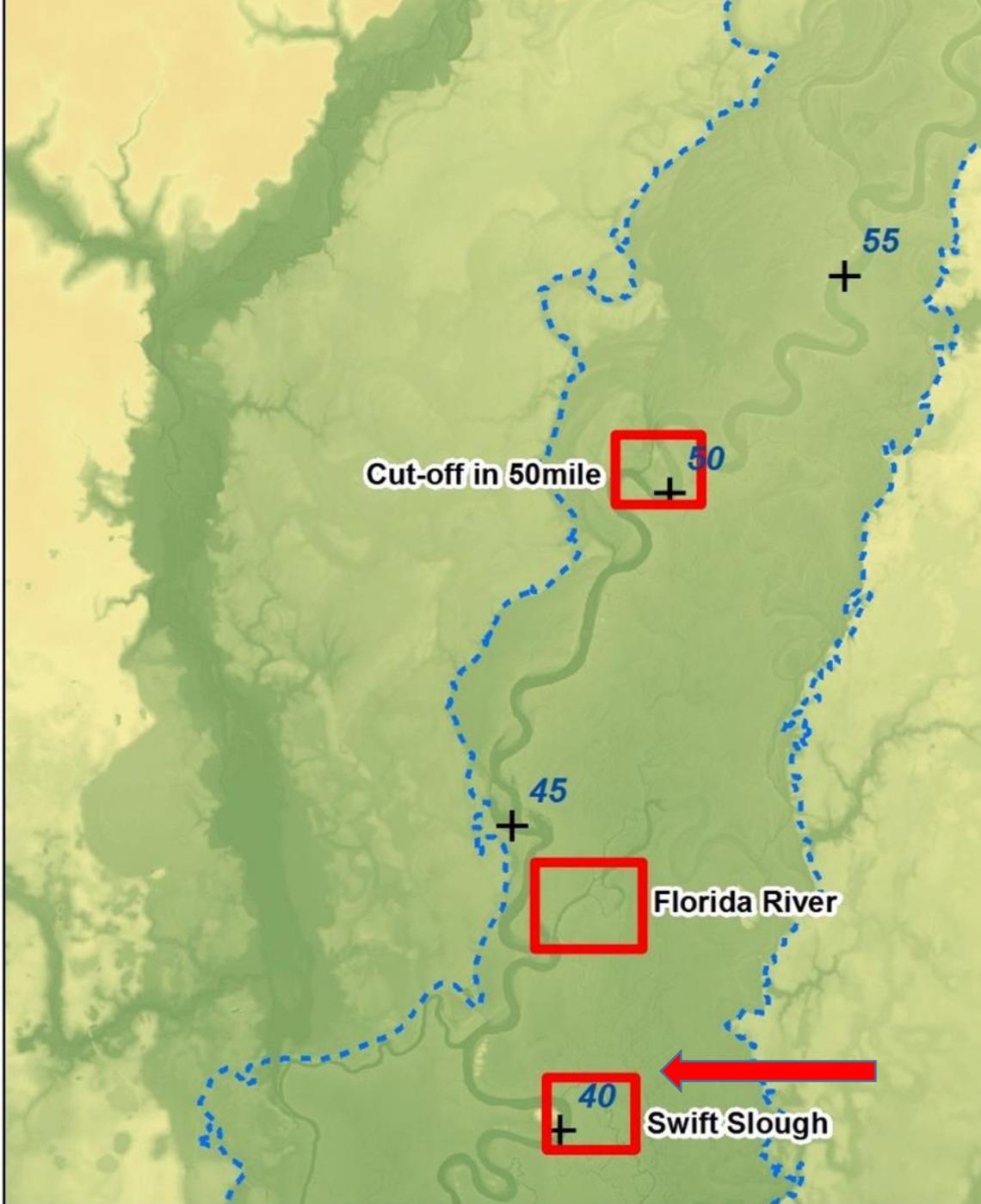
55
+



LOPPING OFF SILLS MIGHT BE FEASIBLE IN SOME CASES



SWIFT SLOUGH



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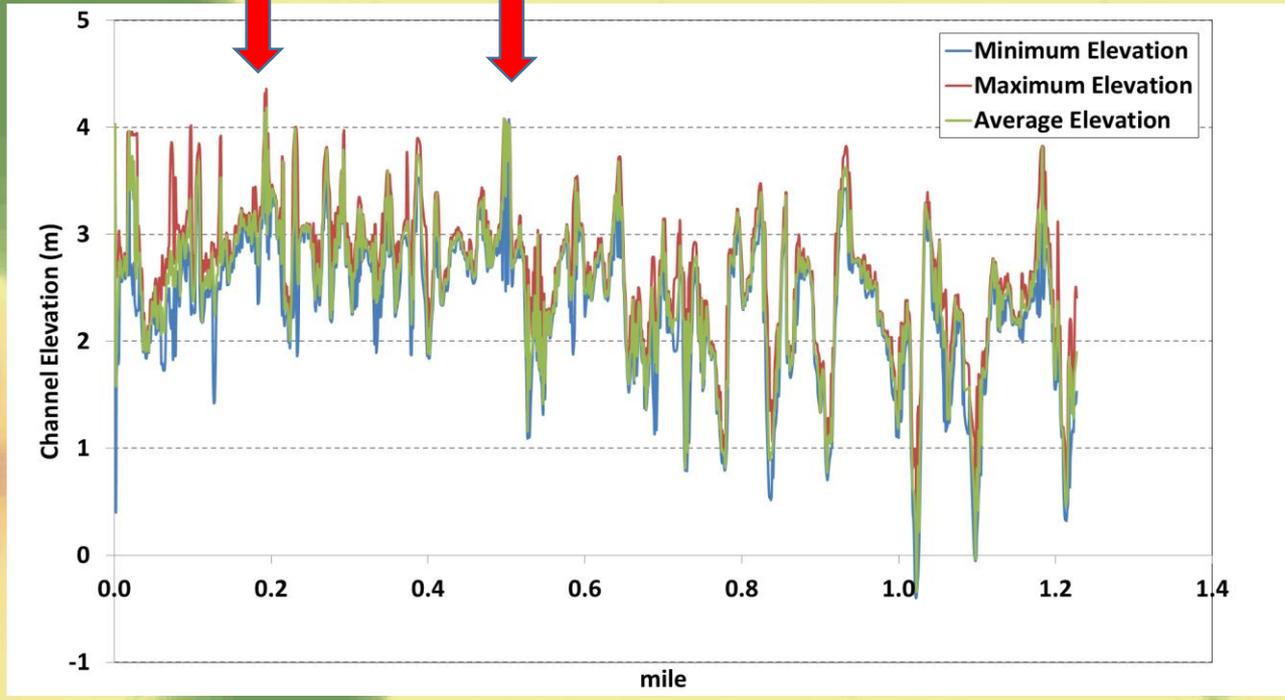
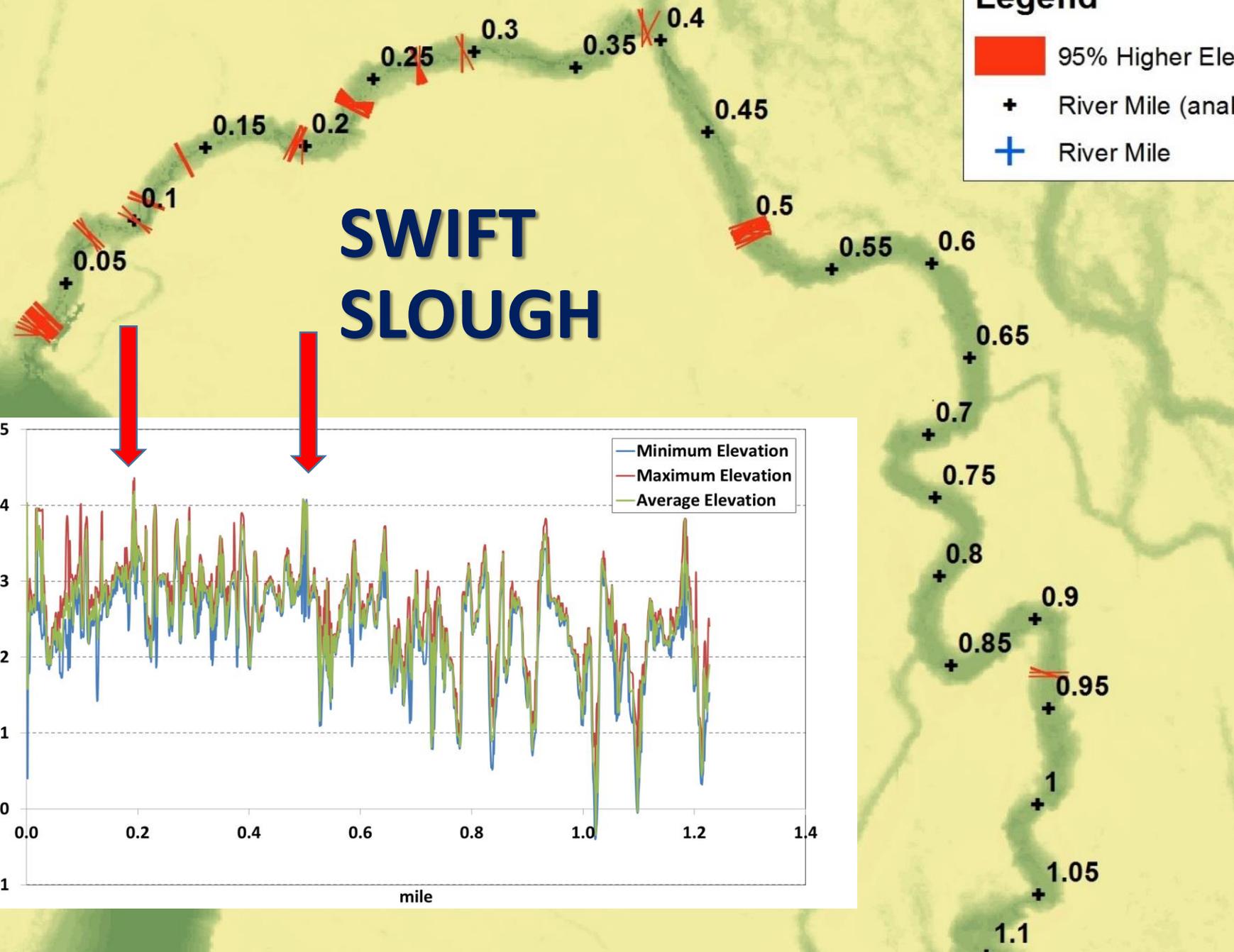


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Legend

- 95% Higher Elevation
- + River Mile (analysis)
- + River Mile

SWIFT SLOUGH

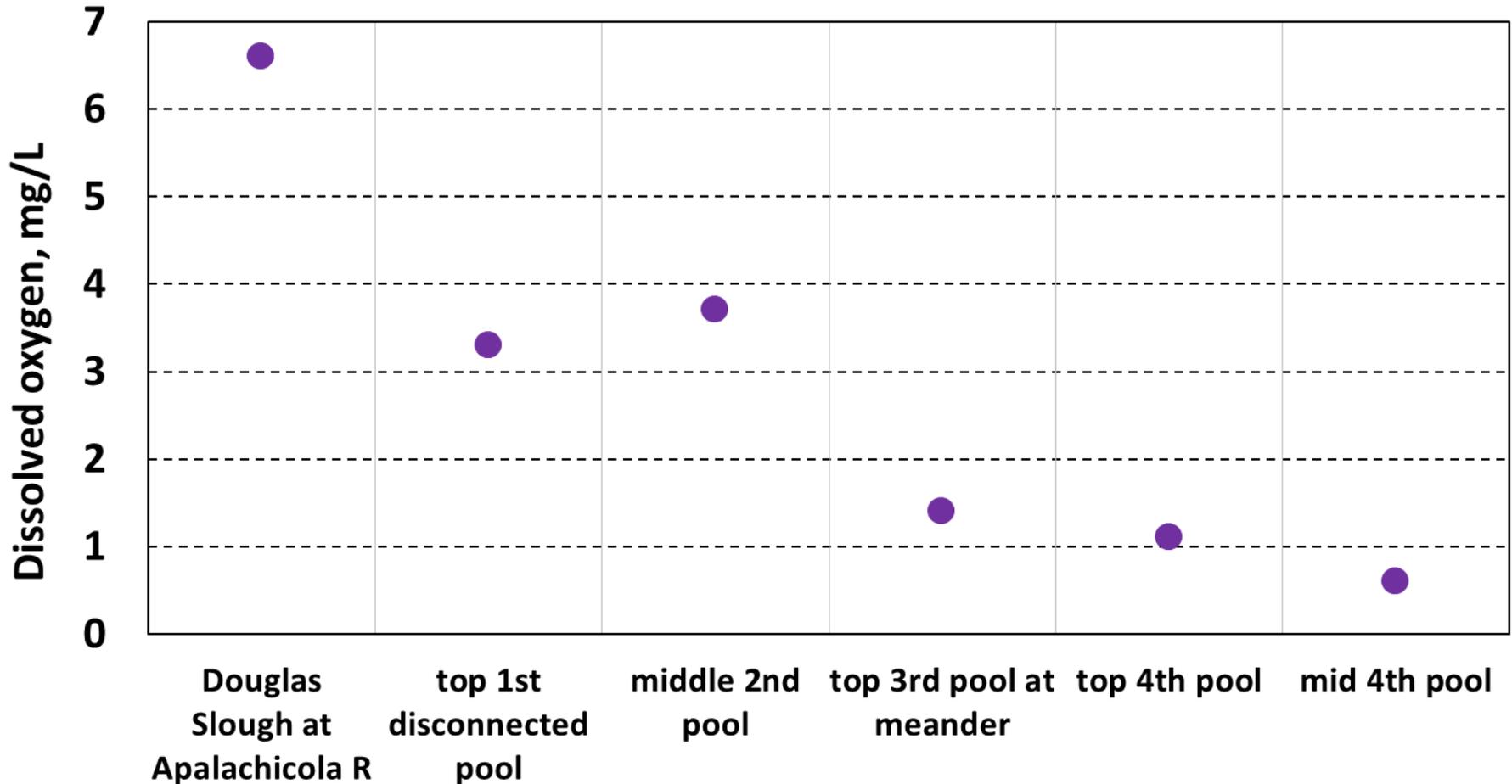




2012/08/01 05:03

DISSOLVED OXYGEN IN SLOUGHS: BASELINE FOR POTENTIAL RESTORATION

Middle Douglas Slough, 29 Sept 2016
from Apalachicola River toward Chipola River

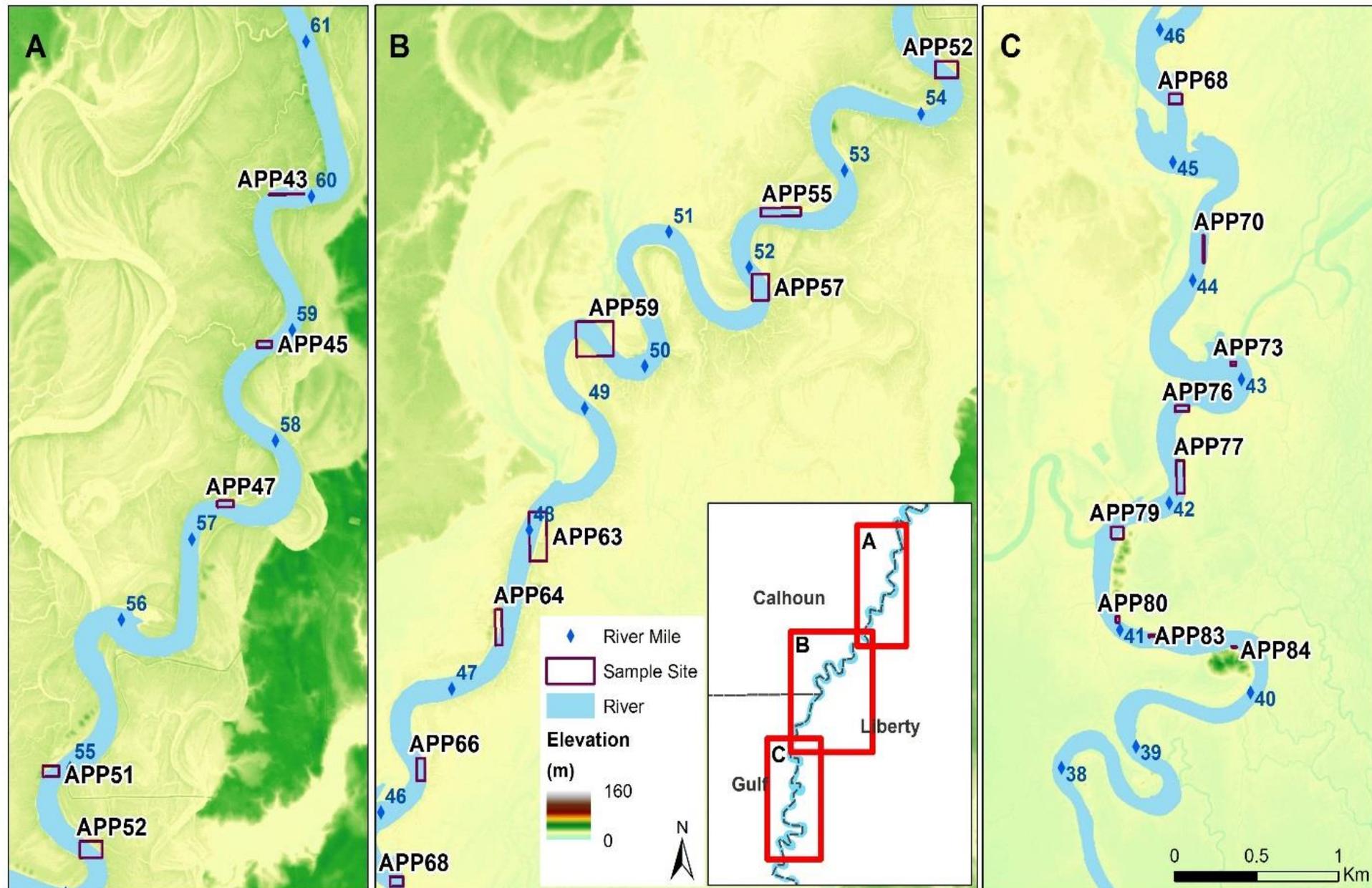


MUSSELS

- High mussel diversity with some species listed
- Fat threeridge (*Amblema neislerii*)
- Purple bankclimber (*Elliptoideus sloatianus*)
- *Alasmidonta triangulate* and *Anodonta heardi* currently proposed for protection under the Endangered Species Act

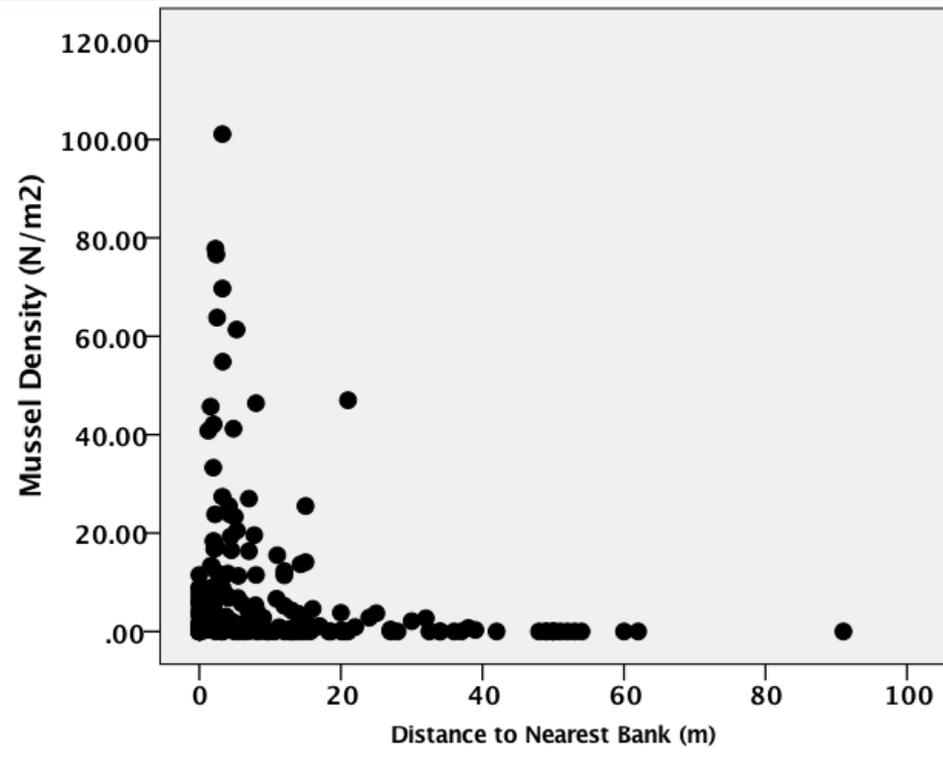
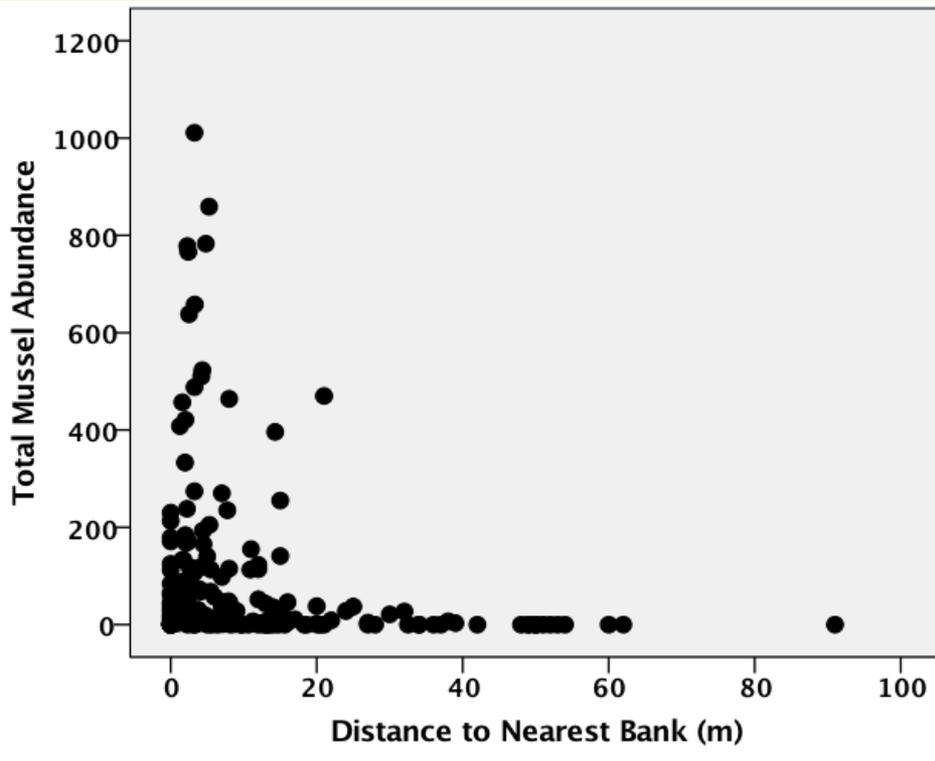


MUSSELS SITES

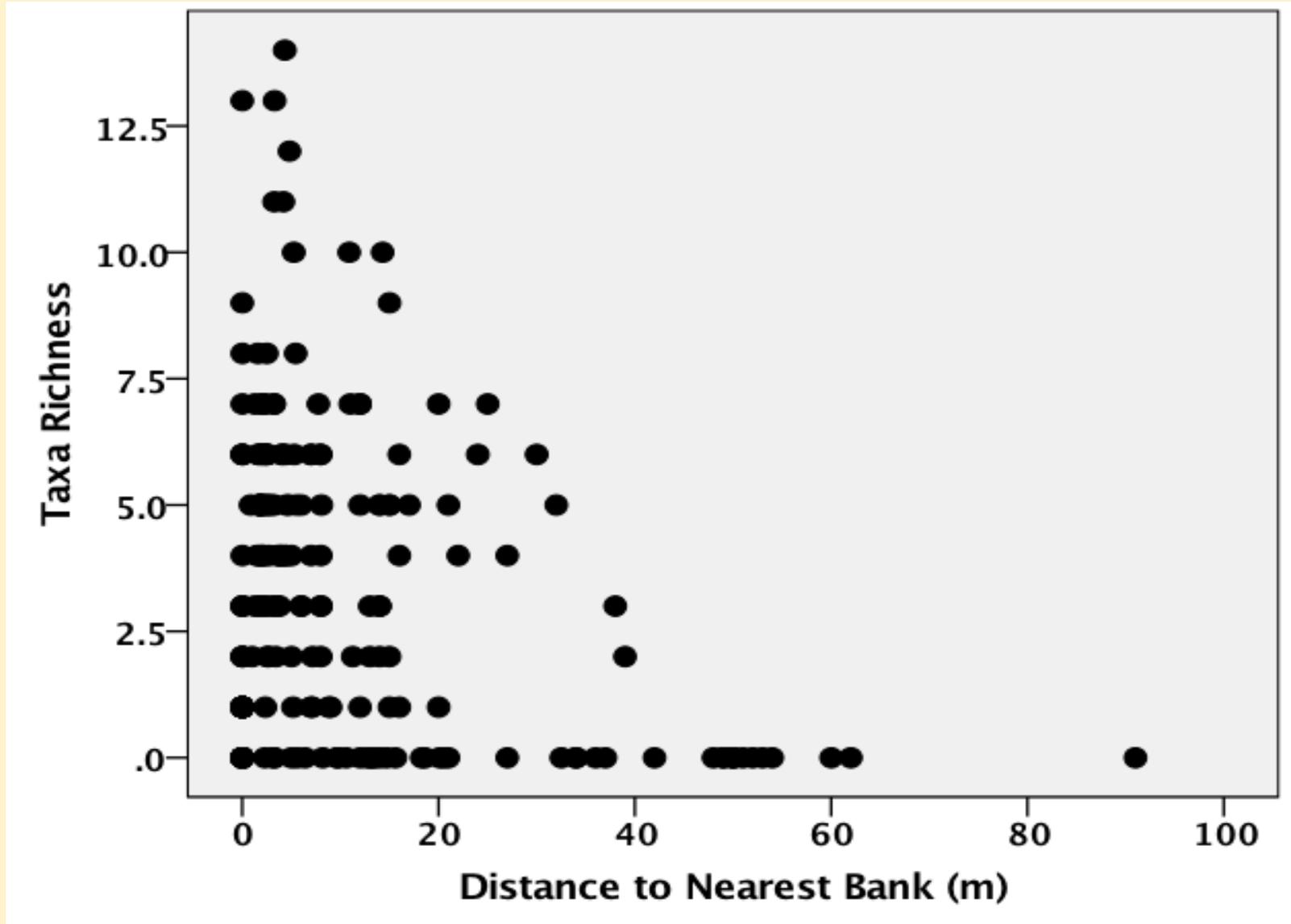


Year	N Sites	Type	Agencies	Focus
2000	7	Qualitative	USGS, USFWS	Channel margins, sloughs
2005	5	Quantitative	FWC, EnviroScience	All habitats
	50+	Qualitative		
2006	8	Qualitative	USGS	Channel margins, sloughs
2007	10	Quantitative	ACOE, USFWS	Channel margins
	45	Qualitative		
2008	10	Quantitative	MG, ACOE, USFWS	Channel margins
	2	Qualitative		
2010	5	Quantitative	MG, ACOE, USFWS	Channel margins
	2	Qualitative		
2011	35	Quantitative	MG, USFWS	All mainstem habitats
	2	Qualitative		
2012	166	Quantitative	MG, USFWS	All mainstem habitats
2015	10	Qualitative	MG, FWC	Sloughs, channel margins
	16	Qualitative		
2016	?	Quantitative	MG, FWC	Deep (>2 m) mainstem habitats
	?	Qualitative		Channel margins
	91+	Qualitative		

MUSSELS ABUNDANCE AND DENSITY VS. DISTANCE TO THE NEAREST BANK: MIDDLE APALACHICOLA RIVER, 2000-2015



TAXA RICHNESS VS. DISTANCE TO NEAREST BANK: MIDDLE APALACHICOLA RIVER, 2000-2015



CONCLUSIONS (PART 1)



- **Proposed model for evolution of hooks and bays**
- **Created longitudinal profile and tied to historic dredging patterns.**
- **Quantified $>1,000,000$ yd³ spoil volume on floodplain. Found that 42% of one mound (CC mound) and 15% of another (SS mound) eroded back into river.**
- **Computed that sand bar area increased 263% between 1941 and 2004**

CONCLUSIONS (PART 2)



- Found dredge mounds to be much coarser than flood deposits.
- Found upward fining of sediments on point bars due to within-bank deposition (dredge history) and winnowing. Upper sand bar has potential for vegetative restoration.
- Developed rapid method for identifying and mapping slough sills (needs field verification).
- DO drops rapidly away from river in disconnected sloughs
- Found that mussels abundance, density and taxa richness all are highest within 20 m of the river bank and decrease with increasing distance away from the bank.

THANKS FOR YOUR ATTENTION!

